PROCEEDINGS

4th International Conference on Technical and Vocational Education and Training (TVET)

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Technical and Vocational Education and Training for Sustainable Societies

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FOREWORD

Welcome for all respected scholars, researchers, post graduate studentsand especially Keynote Speakers to the 4 ICTVET. The theme of the conference focus on Technical and Vocational Education and Training for sustainable societies and consist of six subthemes. i.e Development of learning model on TVET, Workplace Learning and entrepreneurship, Innovationon applied engineering and information technology, Management and Leadership on TVET, Vocational and Technical Teaachers education, and Assessment and Evaluation on TVET.

Sustainable society shoul be followed by the improvement of various factors that have impacts to the quality of vocational and technical education and training, particularly to overcome the competitiveness of the world business. As we have already known the rapid change of technology as well as the change of demography, having a great effects to the life of peoples in this world, The competitiveness need a collaborativeness to survive the life of millions peoples who lost their jobs. Young peoples as aproductive generation have to be creative and innovative to face the competitiveness. So this prociding contents consist of various findings of research in the field of vocational and technical education as well as applied technology and mainly based on the subthemes of the conference.

Finally, we would like to thank a million for all participants of this conference and all parties who support the success of this conference. Hopefully the seminars and scientific work of this seminar can be a reference material for basic education and elementary school teacher education in Indonesia.

Padang, July 2, 2018

Tim Editor

CONTENT PROSIDING ICTVET 2017 REPOSITORY UNP

THE PROSPECT OF OFFSHORE IRON SAND IN TIRAM BEACH PADANG PARIAMAN REGENCY WEST SUMATERA

Adree Octova[1], Ansosry[2], Yoszi Mingsi Anaperta[3], Indah Elok Mukhlisah[4]
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ABSTRACT: The needs of iron sand for raw materials in the national steel industry in recent years has increased sharply. One area that contained offshore iron sand Tiram beach Ulakan Tapakis subdistrict Padang Pariaman Regency. Based on previous research [3] the iron sand found around the Tiram beach spread to Tiku Agam Regency. Beside to viewing the distribution or quantity of iron sand, it is necessary to test its quality to know the prospect of a raw material in the industry. Samples of iron sand were taken as much as 45 points that spread around the research location. This sample is a combination of drilling and test pit. Furthermore, the quality testing activities were conducted in the laboratory to determine the iron content. The results can be concluded that Fe content of iron sand is linear with depth. The spreading of iron sand is about 30 meters from the sea. The average quality of iron (Fe) using Atomic Absorption Spectrophotometry method (AAS) is 2,38892%.

Keywords: Iron sand, Fe Quality, Model, AAS

1. INTRODUCTION

The potential and distribution of iron sand in Indonesia are found in many beaches such as West Sumatera, South Java, Kalimantan, Sulawesi, Nusatenggara and Maluku islands, but so far exploration activities related to iron sand deposit have not been done thoroughly and systematically [6]. In 2012 based on data from the Geological Agency of the Ministry of Energy and Mineral Resources, Indonesia is estimated to have a potential iron sand as much as 182 million tons of ore and 63 million tons of metal.

Seeing this potential, the development of iron sand mineral resources in Indonesia is time to do, so that if managed and utilized properly will improve the national economy. One of the areas in West Sumatra that has the potential is Padang Pariaman regency, especially from the area of Outer Beach of Ulakan Tapakis. The estimated potential of iron sand mineral resource in Padang Pariaman Regency is 46 million tons in the form of ore and 9 million tons in the form of metal with the unexploited condition.

This research will do some activities of iron sand exploration; first: a preliminary investigation of iron sand (survey and mapping of sampling sites) with a research area of 1000 meters x 130 meters.Second: Getting 45 samples by drilling and test pits.The drilling samples spacing is about 20 meters to 300 meters, while under test pit spacing is about 25 meters. Third: making the model of potential iron sand. Forth: laboratory analysis to make measurements of iron (Fe). This step is using Atomic Absorption Spectrophotometry method (SSA).

2. IRON SAND

Offshore iron sand is sand deposits containing iron ore particles (magnetite), which are located along the coast.This is formed by the process of destruction by weather, surface water, and waves against the origin rock that containing iron minerals such as magnetite, ilmenite, iron oxide, and then accumulate and washed out by the waves of sea water.

Iron sand is one of the minerals of the iron ore group, a type of dark sand containing iron ore particles (magnetite) located along the coast. Generally, iron sand is composed of opaque minerals that have been mixed with granules of nonmetallic minerals, such as quartz, calcite, feldspar, pyroxene, and biotite. Opaque minerals contained in iron sand include magnetite, titaniferous magnetite, ilmenite, limonite and hematite. Iron sand has black color, metal luster, specific gravity 1.8 ton/m^3, and the grain size is from 116 mm to 2 mm. Iron sand has high magnetism properties.

The availability of iron precipitation can be grouped into three types: First is primary iron ore deposits, occur due to the hydrothermal process, second is the iron sediment of iron is formed by the weathering process and third is secondary iron deposits (iron sand) [7].

Economical iron deposits are generally Magnetite, Hematite, Limonite, and Siderite. Sometimes it can be a mineral; Pyrite, Pyrrhotite, Marcasite, and Chamosite. Iron is a component of the earth's crust, which is about 5%. The iron is not found in pure form but in the form of compounds with other elements, such as hematite (Fe_2O_3), magnetite (Fe_2O_4), and pyrit [5].

All strong items are usually made of iron, such as electricity poles, bridges, water gates, building frames such as pins, nails, knives, pines, hoe, wire and so on. The main use of iron is to make the steel.

3. IRON SAND EXPLORATION

Iron is one of the natural resources that most abundant in nature and most use in life. Iron found in nature in form of compounds, such as hematite, magnetite, pyrite, and siderite. From iron ore minerals, magnetite is a mineral with the highest Fe but there is a small amount. While hematite is the main ore mineral needed in the iron industry. One of the uses of iron ore is as steelmaking material. Basically, there are a lot of iron ore mineral as well as contact metasomatic secondary sludge buried and exposed randomly.

In practice, the exploration activities carried out by utilizing the properties of physics and chemistry of rocks, soil, elements and minerals, such as: magnetism, density, electricity, radioactivity, and mobility elements. There are several methods that can be used to describe these properties [4].

Iron sand exploration in this research is including several activities that starting from planning, field work, and laboratory activities.All of this steps are doing to know their sand potential.

3.1 Drilling

This drilling is intended to take the sample of iron sand in the surface or subsurface of along the coast. The work of iron sand drilling is done by using shallow drill both manual (dormer) and semi-mechanical. The activities undertaken are followed:

- Determinating of drill point location
- Setting the drilling equipment
- The initial hole preparation is carried out using the type of Ivan drill bit to the groundwater level.
- After penetrating the groundwater layer, drilling is done by using a casing inside which is installed the bailer.
- The drilling is stopped until the bedrock.

3.2 Test Pit

It is generally done on old iron sands that have been compacted. This activity is intended to take the samples of coastal iron sand in certain depth until reaches the surface of the water. The activities undertaken are followed:

- Determinating of the location of test pits
- Excavating with a well opening area of 1-meter × 1 meter or 1.5 meters × 1.5 meters.
- Making the buffer in case of collapse
- The good made is stopped when it reaches the surface of the water or has reached the bedrock.

3.3 Sample Preparation

The preparation process in the field for drill and test pit samples can be done by two methods, namely: increment and riffle splitter. The samples taken should be homogeneous from each depth interval. With sufficient representative, taking will ensure the accuracy of chemical analysis, calculation of resources or reserves of coastal iron sand deposits. The sampling is based on the standard procedure in coastal iron sand exploration.

The activities undertaken in the preparation by the incremental method are:

- Samples of drilling or test pit iron sand are accommodated on a container and stirred until homogeneous
- The sample is inserted in the increament box, flattened and divided into a box-sum line
- The sample are reduced by the increament spoon of the increament box, from each box accommodated in the sample bag
- The reduction contents are dried
- The dried container of each interval are divided into 3 parts. One section for individual samples, one for composite and one for duplicate.
- One part of the sample intervals combined with other intervals into composite samples.

Activities carried out in the preparation process by roffle splittermethod, that are:

- The samples of iron sand from drilling or test pitsare accommodated in a container and stirred to homogeneous, then dried
- The dried samplesare reduced with a riffle splitter until certain weight.
- The samples that have been splitted from each interval are divided into 3 parts. One section for individual samples, one for composite and one for duplicate
- One part of the sample intervals combined with other intervals into composite samples.

3.4 Laboratory Analysis

Laboratory analysis work includes chemical and physical analysis. Chemical analyzes were performed on individual samples to find out the elemental content in the concentrate, including: total Fe and titan. Chemical analysis can be done by several methods, including AAS, volumetric, XRF and ICP.

Physical analysis conducted to mineral grain analysis, sieve analysis, magnetic properties analysis and specific gravity. Grain mineral analyzes were performed to determine the type and percent weight of minerals for both the magnetic fraction and the nonmagnetic samples. This analyzed by grain minerals derived from composite samples representing the area or drilling block. Sieve analysis is intended to determine the size of iron sand.

4. ATOMIC ABSORPTION SPECTROPHOTOMETRY(AAS)

Spectrophotometry is a quantitative analysis method based on the amount of radiation produced or absorbed by the atomic or analytical molecules. One part of spectrophotometry is Atomic Absorption Spectrophotometry (AAS), which is a quantitative method of elemental analysis that the measurement based on the absorption of light with certain wavelength by a metal atom in free state [8].

The advantages of the AAS method are high sensitivity and high accuracy because it can measure the metal content with ppm unit, fast analysis, requires little sample and can be used to determine the concentration of metal concentration without separating [2].

4.1 Basic Principles of AAS

The basic principle of atomic absorption spectrophotometry is the interaction between electromagnetic radiation and the sample. Atomic absorption spectrophotometry is an excellent method for the analysis of substances at low concentrations [2]. This technique is the most common used for elemental analysis. A key component of the atomic absorption spectrophotometry method is the system to produce atomic vapor in sample.

The SSA method is principally on the absorption of light by atoms. Atoms absorb the light at certain wavelengths, depending on the nature of the elements. With energy absorption, it means obtaining more energy, an atom at ground level raised its energy level when excited. The success of this analysis depends on the excitation process and obtaining a proper resonation line.

Atomic absorption spectrophotometry is a method of determining the concentration of an element in a sample by measuring the absorbance of the atomic vapor that produced at a particular wavelength. According to Lembert-Beer's law that many of the absorbed rays are proportional to the number of absorbing atoms. Mathematically can be expressed as follows:

$$A = \log (Po/Pt) = a.b.c \qquad (1)$$

Where A is the absorbance, Po is the intensity of the initial light, Pt is the intensity of transmitted light, a is the absorptivity constant, b is the absorbing medium and c is the concentration [2].

4.2 AAS Components

The Atomic Absorption Spectrophotometry Equipment (AAS) device consists of several principal parts: light source (cathode lamp), flame system (place of atomization), monochromotor, detector, and recorder. The five systems of the equipment are assembled into AAS as Fig.1.

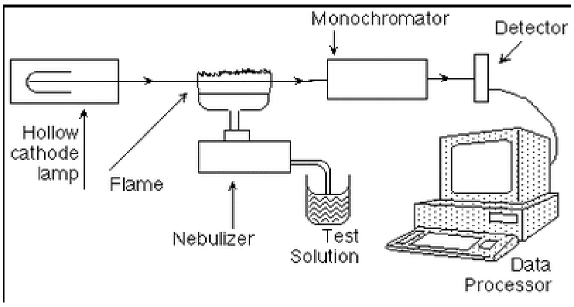

Fig.1 General schema of AAS components

5. METHODS

According to [1] in Geology Map Sheet Padang, Sumatra. The rock formations of Padang Pariaman Regency and its surroundings are dominated by alluvial deposits that consisting of silt, sand, and gravel. This deposits are widespread in almost all the coastal Padang Pariaman. Lithology information affects by coastal resistance to the erosion process by waves and tides [9]. The rock formation of Padang Pariaman Regency can be seen on the map of minerals distribution in Fig.2.

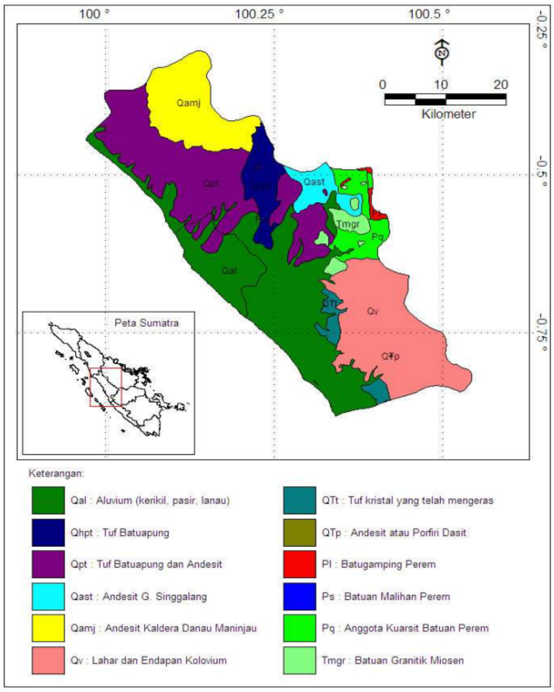

Fig.2 Materials distribution in Padang Pariaman

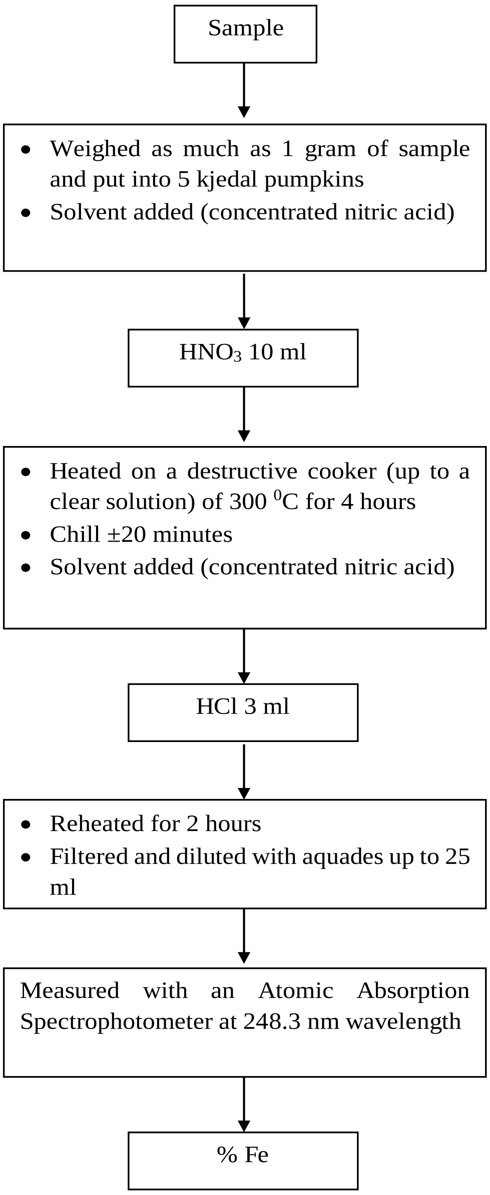

Fig.3 AAS flowchart

The steps of this research follow:

- The coordinates were collected from the field survey results with the research area 1000 meters x 130 meters.
- The samples of iron sand were 6 point drilling parallel shoreline with spacing 120-300 meters and 18 vertical drilling points with 20-125 meter spacing of the beach.
- Iron sand sampling was also done by making test pit with good dimension 1-meter × 1-meter × 1 meter with spacing of 20 meters as Fig.4.
- Laboratory test iron quality (Fe) in the iron sand. In AAS test, the sample was weighed 1 gram, then given a solution of Hydrochloric Acid (HCl) and Nitric Acid (HNO_3), the solution was heated for 6 hours until the Fe metals dissolved. The next step of the sample is cooled, filtered, and diluted with quads. This sample is further incorporated into a spectrophotometer with a wavelength of 248.3 nm. The results of the Fe sample will appear on the computer screen of the tool. The step of AAS analysis is shown in Fig.3.

6. RESULT AND DISCUSSION

Parallel coastline line 1, on the first meter, was found iron sand mixed with fine sand with very dark black sand and iron. Specifically, along the coastline, the average iron sand has been found at a depth of 0.3 or 0.5 meters and is continuously at a depth of 1.5 meters to 2 meters. At a depth of 2 meters to a depth of 4 meters of iron sand begins to disappear and if there is mixed with fine to medium sand by forming vein layers. Along this coastline drilling activity is a little difficult to do at a depth of 4.5 meters to 5 meters this is caused because at a depth of 4.5 meters to 5 meters has reached the water surface and caused the wall drilling hole collapsed. The percentage of Fe content for along the coast is very constant that is between 1 - 3% and the more drilling hole value also the greater the value of this is due to the age of the iron sand sedimentation process.

Parallel coastline line 2, the first meter up to the second meter of iron sand has not been found and the new iron sand is found at a depth of 2.0 - 3 meters with the coating condition is not constant and thick. For the 2nd line parallel the coastline Fe content is quite high compared to line 1. On this line 2, the Fe content reaches 4.7275% found on the drill point DH 12.

Parallel coastline line 3, the first meter found top soil, and on the next meter found the fine to medium sand. For this 3rd line from 6 points of drilling did not find any iron sand. The drilling was stopped at a depth of 3.5 meters as water surface was found and drilling activity had to be stopped because it was no longer possible to continue. In line 3 there is no sample test and the Fe content on line 3 is considered zero.

Parallel coastline line 4, the first meter found top soil, and on the second meter found the fine to medium sand. At a depth of 3.5 meters found the sand is slightly yellow in color. In line 4 is also not found iron sand to a depth of 5 meters so there is no test sample and Fe content on line 4 is considered zero.

The highest percentage of Fe content of 4.7275% is found at drill point DH 12 at depth of 2.6 meters to 5.0 meters and the smallest is at point DH 03 which is 0.7856% at depth of 0.5 meters to 1, 5 meters. Based on the test samples from each of the drilling points and test wells, from Table 10 and 11 the Fe content obtained is very low and tends to be the same (homogeneous) ranging from 1 - 4%, this is also evidenced by the dispersion of iron sand deposits that are not too far, and to near the shore at a depth of 0.3 meters above the surface has been found iron sand to a depth of 1.5 meters to 2 meters in the form of a layer that little inserted fine sand. The difference in the percentage of this content is influenced by the precipitation time, the iron sand that precipitates than the level is higher. The AAS results can be seen in Table 1 and 2.

The thickness of the iron sand sediment layers parallel to line 1 and line 2 line shapes varies considerably from 1 meter to 1.5 meters with thin layer coated geometries. This is due to the morphology of bedrock and precipitation mechanisms. The thickest layers are generally located along the coastline, on average on line 1 but the levels are lower than the line 2 parallel to the shoreline.

Table1Fe quality from drilling results

No	Sample Code	Fe (%)
1	DH 01.A	1.8100
2	DH 01.B1	1.7850
3	DH 01.B2	2.3037
4	DH 01.B3	2.3631
5	DH 02.A	0.9681
6	DH 02.B1	1.1381
7	DH 02.B2	1.2362
8	DH 02.B3	2.4318
9	DH 03.A	0.7856
10	DH 03.B1	1.7718
11	DH 03.B2	2.3081
12	DH 03.B3	2.4550
13	DH 04.A	0.8475
14	DH 04.B1	1.9456
15	DH 04.B2	3.0193
16	DH 04.B3	3.5893
17	DH 05.A	1.4987
18	DH 05.B1	2.2381
19	DH 05.B2	2.7418
20	DH 05.B3	3.2806
21	DH 06.A	2.1150
22	DH 06.B1	2.3006
23	DH 06.B2	2.3918
24	DH 06.B3	3.0793
25	DH 07.B1	2.1693
26	DH 07.B2	2.3700
27	DH 07.B3	2.6606
28	DH 08.B1	2.8668
29	DH 08.B2	3.0587
30	DH 08.B3	3.2737
31	DH 09.B1	1.9918
32	DH 09.B2	2.0106
33	DH 09.B3	2.8731
34	DH 10.B1	3.2800
35	DH 10.B2	3.3612
36	DH 10.B3	4.2762
37	DH 11.B1	3.5581
38	DH 11.B2	3.6818
39	DH 11.B3	4.3093
40	DH 12.B1	4.0543
41	DH 12.B2	4.6181
42	DH 12.B3	4.7275

Table 2Fe quality from test pits

No	Sample Code	Fe (%)
1	Sample 1	2.1020
2	Sample 2	3.7950
3	Sample 3	4.1893
4	Sample 4	4.6437
5	Sample 5	1.4310
6	Sample 6	4.4718
7	Sample 7	2.7700
8	Sample 8	4.1525
9	Sample 9	4.1487
10	Sample 10	3.0187
11	Sample 11	2.8325
12	Sample 12	2.2475
13	Sample 13	2.1737
14	Sample 14	2.8668
15	Sample 15	1.5362
16	Sample 16	1.5862
17	Sample 17	3.3525
18	Sample 18	1.7381
19	Sample 19	1.4175
20	Sample 20	1.2237
21	Sample 21	2.1137

From the results of this drilling activity, it is very clear that the dispersal of iron sand deposits is not too far away. In the first phase drilling activities are conducted along the coastline with a distance of 10 meters from sea water with conditions on the tides. From this activity, the iron sand has been found at a depth of 0.3 meters or 0.5 meters below the sand surface. When viewed in plain iron sand found in black color and when inserted into the sample bag of 0.5 kg will be heavier than the sand beach that is inserted into the sample plastic bag with the same amount. For those along this coastline, drilling is done as much as 6 points with distances ranging from 100 meters to 300 meters. This is done to anticipate the loss of a layer of iron sand. In the second phase drilling activities are done to the east with a distance of 130 meters from the shoreline and just 3 meters from the path of paved residents. In this activity for a depth of 0 - 0.8 meters found top soil, and at a depth of 1 meter to 2.5 meters found the fine to medium sand. At depths of 2.5 meters to 5 meters are not found also deposition of iron sand.

In the third stage drilling activities to the sea by narrowing the distance of the drill of the beach is ± 40 meters. From this drilling activity at a depth of 0 - 0.5 meters found top soil is blackish brown. For the depth of 0.5 meters to 2.5 meters found the fine to medium sand. At a depth of 2.5 meters to 3 meters found fine sand with little mixed with water. And at a depth of 3 meters to 5 meters drilling activity is a little difficult because it has found water and caused drilling holes to collapse. And on drilling activities with a distance of 40 meters from the beach is not found iron sand.

In the fourth stage, the drilling distance from the shoreline is narrowed by 20 meters from the first drill point. At a depth of 0 - 2 meters found fine to medium sand and new iron sand found at a depth of more than 2 meters. The condition of passion iron layer from 20 meters distance is not very good compared with a distance of 10 meters from sea water (waves), which for a distance of 10 meters from the sand beach that is found very dominates the meaning of the condition of iron sand layer is inserted by a little fine sand until while if for a distance of 20 meters from the beach coating fine sand until moderately inserted by iron sand.

The model of cross-section of the parallel layer of coastline can be seen in Fig.5, 6, 7, 8, 9, 10, and 11.

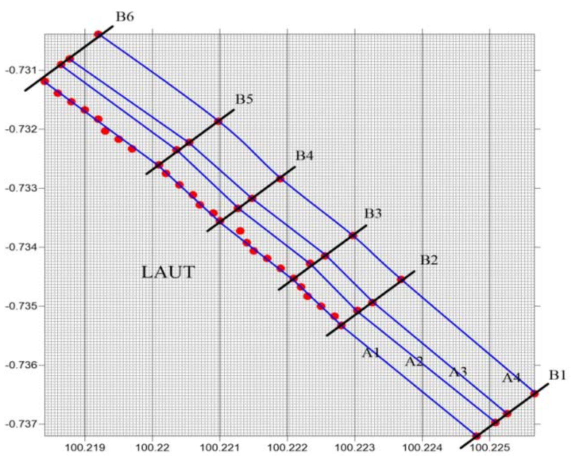

Fig.4 Measurement design

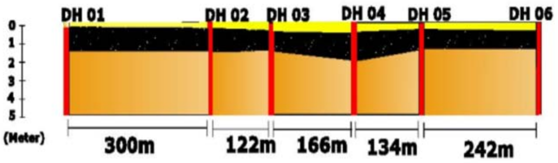

Fig.5 Section 1Parallel coastline line 1

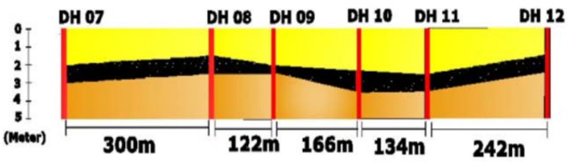

Fig.6 Section 2 Parallel coastline line 2

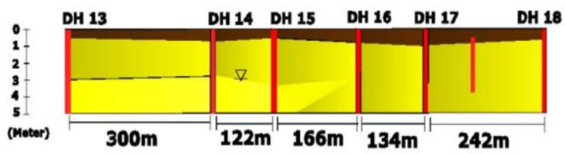

Fig.7Section 3 Parallel coastline line 3

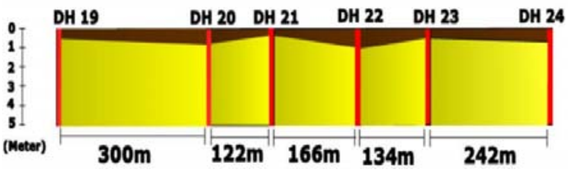

Fig.8 Section 4 Parallel coastline line 4

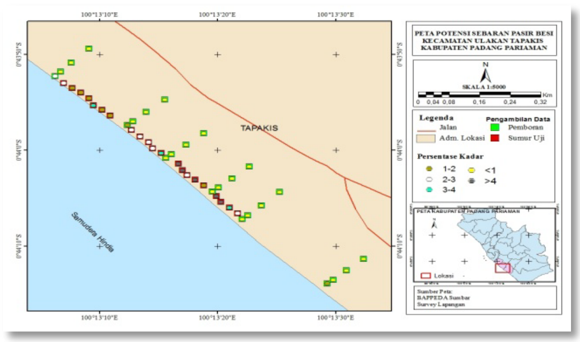

Fig.9 Map of the potential of iron sand distribution at Depth 0,3 - 2 meters

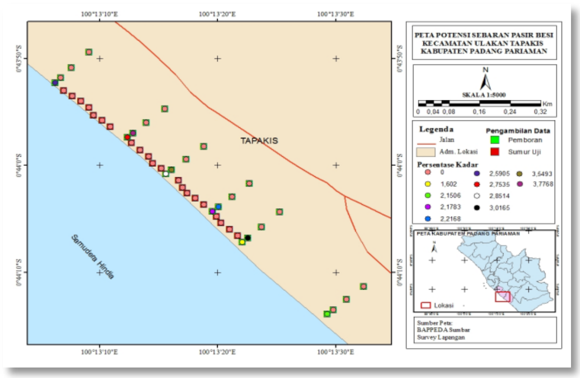

Fig.10 Map of the potential of iron sand distribution at Depth 2 - 5 meters

7. CONCLUSION

The area of investigation Geologically prospects for iron sand deposits from West to East. Research area lithology consists of top soil, fine to medium sized sand, pumice stone, and iron sand. The iron sand is found only in line 1 and 2, and the iron sand deposit is not found any more at a distance of more than 30 meters to the east. Fe quality of iron sand using atomic absorption spectrophotometry method has the average about 2.38892%.

8. ACKNOWLEDGMENTS

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