

HISTORY OF MANUSCRIPT PUBLICATION

(Applied Environmental Research)

Identification of Saline Water Intrusion Using Integrated Geoelectrical Method in the Coastal Aquifer of Holo-Quaternary Formation, Lampung Bay

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I. SUBMISSION

2020-04-06

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II. ASKING ABOUT STATUS OF THE MANUSCRIPT 2020-04-18

The screenshot shows an email interface with a dark sidebar on the left containing navigation options like 'Back to Submissions', 'Submitted', 'Subn', 'Pre-F', 'Name', 'AER', and 'Please Editor'. The main content area is titled 'Messages' and contains the following text:

Note

From: cpenrade
2022-04-18 11:33 AM

Dear Authors,

We are writing this message regarding to your manuscript entitled "Identification of saline water intrusion using integrated geoelectrical method in the coastal aquifer of Holo-Quaternary formation, Lampung Bay" submitted to Applied Environmental Research (AER) for potential publication. Regarding an initial review, the work requires an initial revision before it can be proceeded for further review by experts. Please consider the following issues for your initial revision.

- The work is within the scope of the journal however, the content of the work lacks of the aspects of environmental significance. Thus, it is highly recommended authors to add more information on the environmental impacts of the seawater intrusion in the study area.
- In addition, results and discussion requires significant improvement as the current form of the work was likely to be the reports of the results obtained. The results were not compared to other studies within either the same study area or other areas with similar context of this study and the results were not critically discussed.
- Conclusion is relatively too long and should be shortened. In addition, recommendations for further study should be added.

We are expecting to your initial revision by 2 May 2022. Please kindly noted that the initial revision should be submitted through the online system continuing from the previous submission.

Sincerely yours,

The screenshot shows a Gmail inbox with the following details:

- Search: label:aer
- Active status: Active
- 10 of 15 emails
- Subject: A manuscript number has been assigned to Identification of Saline Water Intrusion Using Integrated Geoelectrical Method in the Coastal Aquifer of Holo-Quaternary Formation, Lampung Bay - [EMID:489b130be9834327]
- Sender: AER <em@editorialmanager.com>
- Date: Thu, May 12, 2022, 8:39 AM
- CC: "Agus Setiawan" <aslullia@yahoo.com>, "I Gede Boy Darmawan" <igedeboy@eng.unila.ac.id>, "Suharno Suharno" <suharno.1962@eng.unila.ac.id>, "Nandi Haerudin" <nandi.haerudin@eng.unila.ac.id>
- Body text:
 - Dear Mr. Rustadi,
 - Your submission entitled "Identification of Saline Water Intrusion Using Integrated Geoelectrical Method in the Coastal Aquifer of Holo-Quaternary Formation, Lampung Bay" has been assigned the following manuscript number: AERJOURNAL-D-22-00022.
 - You will be able to check on the progress of your paper by logging on to Editorial Manager as an author. The URL is <https://www.editorialmanager.com/aerjournal/>.
 - Thank you for submitting your work to this journal.
 - Kind regards,
 - Applied Environmental Research

<https://mail.google.com/mail/u/0/#label/AER/FMfcgzGpFqWRkfTHglQFsXsmhttBLvrQ>

III. REVISION 2022-06-13

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Ref: Ms. No. AERJOURNAL-D-22-00022
Article Title: "Identification of Saline Water Intrusion Using Integrated Geoelectrical Method in the Coastal Aquifer of Holo-Quaternary Formation, Lampung Bay"
Applied Environmental Research

Dear *Mr. Rustadi*,

Reviewers have now commented on your paper. You will see that they are advising that you revise your manuscript. If you are prepared to undertake the work required, I would be pleased to reconsider my decision.

For your guidance, reviewers' comments are appended below.

If you decide to revise the work, please submit a list of changes or a rebuttal against each point which is being raised when you submit the revised manuscript.

Your revision is due by **2022-07-12 23:59:59**.

To submit a revision, go to <https://www.editorialmanager.com/aerjournal/> and log in as an Author. You will see a menu item call Submission Needing Revision. You will find your submission record there.

Yours sincerely
Nattapong Tuntiwattanapun, Ph.D.
Editor
Applied Environmental Research



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To: Rustadi Rustadi <rustadi.1972@eng.unila.ac.id>

Mon, Jun 13, 2022 at 10:16 AM

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Article Title: **"Identification of Saline Water Intrusion Using Integrated Geoelectrical Method in the Coastal Aquifer of Holo-Quaternary Formation, Lampung Bay"**
Applied Environmental Research

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If you decide to revise the work, please submit a list of changes or a rebuttal against each point which is being raised when you submit the revised manuscript.

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To submit a revision, go to <https://www.editorialmanager.com/aerjournal/> and log in as an Author. You will see a menu item call Submission Needing Revision. You will find your submission record there.

Yours sincerely

Nattapong Tuntiwiwattanapun, Ph.D.
Editor
Applied Environmental Research

Comments from the Editor and Reviewers :

Reviewer #1: The article is possible to be published, but some revisions are needed. Here are some suggestions to modify the article:

1. The article should clearly state its novelty and significance as well as its distinction to other studies. Firm statements about these issues have not appeared on the manuscript.
2. Some claims in the introduction need clarification or references. For example, "Seawater intrusion in the coastal of Bandar Lampung.....(Line 39-41)" or "The limited ability to provide.....on the coast of Bandar Lampung.(Line 49-51). Are there any studies to support these statements or they are merely author's opinions?"
3. Statement in line 59-61 sounds like a personal reason that is not really necessary to be mentioned. However, if the author can convince the readers about better results obtained in spite of low budget, it can be a strong point of this research.
4. To introduce the case study area, I suggest the author to add the orientation map of the case study area relatively to the Indonesian map or paragraphs to describe where the case study area is. Therefore, general audiences can easily recognize the case study area.
5. Figures and their explanations in this manuscript need to be rearranged to guide the readers follow the flow of the research. For example, figure 1 (line 109) has no explanation while the statements to refer figure 1 (line 148 and line 219) are too far. Moreover, the readers will be confused since the author suddenly jump to figure 8 (line 167) before mentioning figure 2,3,4, and so forth.
6. Figure 2,3,4,5 are essential for this study but they are not widely explained. I suggest the author to explore these figures more widely (e.g. what do they mean, how they are interpreted, compare their similarities or differences, etc.)
7. In line 237 - 238 the author mention Bumiwaras sub-district and Way Lunik village that suddenly appear but never be discussed before and I guess sub-district and village are not equal to be compared (in term of geographical scale). Indeed, it confuses the readers. I suggest the author to give more clearly geographical orientation on this issue.
8. (Line 288 - 290) "The problem of....., which will focus on further research." is something that hasn't been conducted in this research. Thus, it is not necessary to be mentioned. In addition, a similar case also appears in line 290 - 293. The author mentioned about environmental problems..... and make a comparison with Jakarta (That is actually never analyzed in this manuscript). Moreover, is Bandar Lampung and Jakarta fair comparison (in terms of geographical scale,

population, sosio-economic activities, etc)?

9. The conclusion should wrap up the whole story and revisit the research purposes with findings. This aspect has not been found in this manuscript. Besides, the conclusion should avoid new things that were not analyzed in the discussion. (Line 313-314) The author mentions about land fertility, land subsidence, and flooding caused by groundwater exploitation. How can the author conclude without any analysis or literature review?

10. The manuscript uses understandable English, but proofreading is highly recommended. Some typos, wordiness, run on sentences (e.g. Line 121-123, Line 252-254), strange vocabularies or phrases (e.g. weak application (Line 49), strengthened by the difficulty of... (Line 193), the use without holistic management (Line 268), rain catch engineering (Line 316)), and other grammatical errors are found in this manuscript.

Reviewer #2: This manuscript discussed the approach for phytoremediation of wastewater. It seems novel and interesting to the reader of this Journal (AER) and in the scope of this Journal. It does add something new in the field of environmental management/construction and so on. Therefore, the reviewer suggests to accept this manuscript with major revision.

1. The authors should provide more information about the "aquifer/holo-quatarnary" is there any contained for industrial wastewater treatment.
2. Please add one topic of "Implications" for Indonesia's case with and try to link out.
3. Based on the outcome of the present study, the author(s) should recommend the extension of the present study as future scope of study. Especially in industrial section.
4. The motivation for the work is propose an integrated geoelectrical method which is profitable as well as environmentally sound, but the paper could be more convincing this is the case.
5. Some figures need to improve high solution.
6. Improve English

Reviewer's Responses to Questions

Is the subject of the article within the scope of the journal? (Yes/No)

Reviewer #1: Yes

Reviewer #2: Yes

Is this a new and original contribution? (Yes/No)

Reviewer #1: Yes

Reviewer #2: Yes

Does the title of this paper clearly and sufficiently reflect its contents? (Yes/No)

Reviewer #1: Yes

Reviewer #2: No

Are the keywords and abstracts/summary informative? (Yes/No)

Reviewer #1: No

Reviewer #2: Yes

Are the interpretation, organization and length satisfactory? (Yes/No)

Reviewer #1: No

Reviewer #2: No

Are the interpretations and conclusions sound and justified by the data? (Yes/No)

Reviewer #1: No

Reviewer #2: No

Are the references relevant and up-to-date? (Yes/No)

Reviewer #1: Yes

Reviewer #2: Yes

Is the quality of the English language satisfactory?

Reviewer #1: No

Reviewer #2: No

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To: Rustadi Rustadi <rustadi.1972@eng.unila.ac.id>

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Identification of Saline Water Intrusion Using Integrated Geoelectrical Method in the Coastal Aquifer of Holo-Quaternary Formation, Lampung Bay

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Article Title: **"Identification of Saline Water Intrusion Using Integrated Geoelectrical Method in the Coastal Aquifer of Holo-Quaternary Formation, Lampung Bay"**
Applied Environmental Research

Dear *Mr. Rustadi*,

Reviewers have now commented on your paper. You will see that they are advising that you revise your manuscript. If you are prepared to undertake the work required, I would be pleased to reconsider my decision.

For your guidance, reviewers' comments are appended below.

If you decide to revise the work, please submit a list of changes or a rebuttal against each point which is being raised when you submit the revised manuscript.

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Yours sincerely

Nattapong Tuntiwiwattanapun, Ph.D.
Editor
Applied Environmental Research

Comments from the Editor and Reviewers :

Reviewer #1: The author has made a significant improvement to respond the review on the first round. However, some issues need more attention to make the manuscript ready to be published:

1. The author have replaced the Bumiwaras and Way Lunik with the terms showing the geographical orientation, which guide readers clearer about the case study area. However, the terms "Bumiwaras" and "Way Lunik" still appear on the highlight section. I suggest to synchronize them.
2. On the method section (line 125 - 165), the author widely explained about the definition of sampling techniques. Nevertheless, what are applied in the case study area has not been thoroughly explored. It's better to explain this issue extensively and arrange the paragraph a sequential style explaining what have been conducted. If it is possible, the paragraph can be equipped with the flowchart to help readers follow the flow of the study.
3. Result and Discussion section have been significantly improved.
4. On the conclusion section, some findings are presented to revisit the research objectives. However, it is better to add some consequences that can be occurred based on the current status. Therefore, some recommendations (either to prevent worse events or to formulate future research) can be given.

Reviewer #2: The revised version can now be considered for acceptance.

Reviewer's Responses to Questions

Is the subject of the article within the scope of the journal? (Yes/No)

Reviewer #1: Yes

Reviewer #2: Yes

Is this a new and original contribution? (Yes/No)

Reviewer #1: Yes

Reviewer #2: Yes

Does the title of this paper clearly and sufficiently reflect its contents? (Yes/No)

Reviewer #1: Yes

Reviewer #2: Yes

Are the keywords and abstracts/summary informative? (Yes/No)

Reviewer #1: Yes

Reviewer #2: Yes

Are the interpretation, organization and length satisfactory? (Yes/No)

Reviewer #1: Yes

Reviewer #2: Yes

Are the interpretations and conclusions sound and justified by the data? (Yes/No)

Reviewer #1: Yes

Reviewer #2: Yes

Are the references relevant and up-to-date? (Yes/No)

Reviewer #1: Yes

Reviewer #2: Yes

Is the quality of the English language satisfactory?

Reviewer #1: Yes

Reviewer #2: Yes

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1 **Identification of Saline Water Intrusion Using Integrated**
2 **Geoelectrical Method in the Coastal Aquifer of Holo-Quaternary**
3 **Formation, Lampung Bay**

4
5 **Rustadi^{1,2*}, Agus Setiawan², I Gede Boy Darmawan¹, Suharno¹, and Nandi**
6 **Haerudin¹**

7 ¹Department of Geophysical Engineering, University of Lampung, Bandar
8 Lampung 35145, Indonesia

9 ²Department of Environment Science, University of Lampung, Bandar Lampung
10 35145, Indonesia

11 *Corresponding author: Email: rustadi.1972@eng.unila.ac.id

12 **Abstract**

13 Increased groundwater extraction from aquifers in Holo-Quaternary rock
14 formations in Lampung Bay has caused saltwater intrusion. This indication
15 appears in several community wells and can spread further inland. Therefore,
16 this study aims to identify the distribution of areas that have been exposed to
17 saline water and the boundaries of areas that have not, especially in the Holo-
18 Quaternary Formation. This research uses the geoelectric method integrated
19 with salinity data and the Soil Penetration Test (SPT) analysis at four drilling
20 points. A total of 4 lines of Electrical Resistivity Tomography (ERT) and 8
21 points of Vertical Electrical Sounding (VES) have been acquired with a
22 Schlumberger configuration with an AB/2 span of up to 200 meters. Meanwhile,
23 the salinity data was measured directly from 60 samples from community wells.
24 The ERT and VES analysis results show that the coastal aquifer in Lampung
25 Bay is at a depth of 2 - 24 m. SPT analysis identified interbedded sand, silt, and
26 clay which were interpreted as marine sedimentation from the Holo-Quaternary
27 Formation layer. Groundwater is only in shallow aquifers (< 24 m) but has
28 experienced seawater intrusion with low resistivity values between 9 – 20 ohms
29 m. The distribution of high salinity values up to 3100 ppm has reached >1 km
30 from the coastline. Furthermore, ERT results reinforce this finding, which shows
31 low resistivity values up to <10-ohm m in the shallow aquifer zone. VES data
32 detects low resistivity values (18-ohm m) at a depth of 12 – 13 m.

33 **Keywords:** Aquifer, holo-quaternary, geoelectrical, intrusion, salinity

34 **1. Introduction**

35 Coastal ecosystems are the most economically productive and densely
36 populated globally [1, 2]. Groundwater from coastal aquifers is the primary
37 source of clean water needs in various sectors, including households, tourism,
38 industry, and commercial centers on the coast. Overexploitation of groundwater
39 in coastal areas has caused environmental problems, including decreased
40 groundwater quality due to seawater intrusion [3–6]. Groundwater
41 contamination in coastal aquifers has become a global issue [7, 8], especially in
42 low and middle-income countries [9, 10].

43 The limited ability to provide clean water and the weak application of
44 regulations are factors for uncontrolled groundwater extraction on the coast of
45 Bandar Lampung. Indications of seawater intrusion have been identified on the
46 coast of Bandar Lampung based on gravity and geoelectric data [11]. However,
47 this result has not been confirmed by groundwater aquifer salinity data
48 integrated with geoelectric data and drilling data. Therefore, an effort is needed
49 to monitor the condition of groundwater aquifers, especially those related to the
50 potential for seawater intrusion in groundwater aquifers. Detailed analysis of
51 seawater intrusion into aquifers requires the availability of monitoring wells to
52 measure geochemistry and groundwater level fluctuations [12–14]. This process
53 requires expensive research costs and is currently a constraint. Therefore, based
54 on the consideration of limited funding sources, this study emphasized
55 measuring the salinity of groundwater in the aquifer as the initial concentration.
56 Groundwater salinity testing is accompanied by the geoelectric method, which
57 many researchers choose for mapping seawater intrusion [15–17].

58 The purpose of the study was to obtain areas that have been exposed to
59 seawater intrusion and as a reference for more detailed research in intertemporal
60 monitoring efforts. Geoelectric delineation is used to map aquifers and lithology
61 constituents on the coast. Compared with several drilling results, the delineation
62 area aims to analyze soil mechanics. The acquisition of salinity data from
63 several wells around the research area was carried out to obtain the distribution
64 of the influence of seawater intrusion. The results of groundwater salinity
65 mapping are then integrated with the distribution of groundwater aquifers
66 resulting from geoelectric measurements. These results are expected to provide
67 an overview of groundwater aquifer areas that have been affected by seawater
68 intrusion and which have not been affected, especially in the Holo-Quaternary
69 Formation. These results provide information on which areas need to be
70 controlled for groundwater use or must be conserved and monitored
71 continuously.

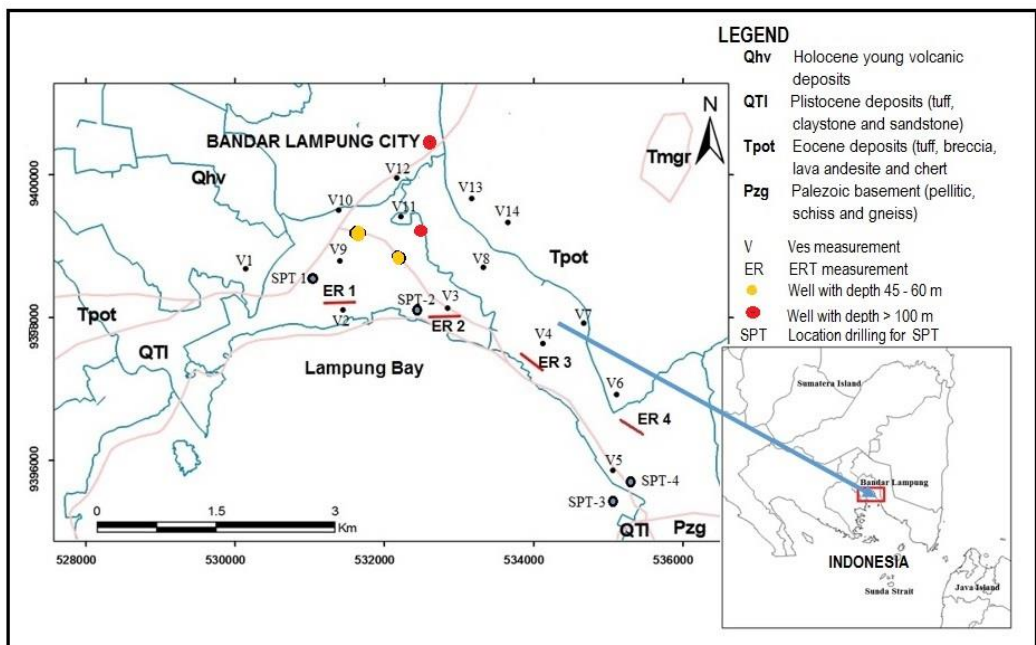
72 **2. Materials and methods**

73 *2.1. Geological setting of the study area*

74 Geohydrology on the coast of Bandar Lampung is influenced by the
75 bedrock height of the Gunung Kasih Complex Formation (Pzgs) of the Pre-
76 Tertiary Paleozoic age (Figure 1). Subduction processes in the past caused the
77 accretion of bedrock in the east [18, 19], with medium-order metasediment
78 constituents in the form of schist and gneiss. Another result is the formation of
79 Mount Betung in the west with hilly morphology by the side with bedrock in the
80 east. The volcanic pathway in the eastern part is interpreted to be the Tertiary
81 age composed of andesite, rhyolite, and granodiorite rocks exposed. Meanwhile,
82 Mount Betung is interpreted to be of Quaternary age with a basal-andesite
83 composition. Various sedimentary rock formations began to form from the
84 Tertiary to the Quaternary as bedrock cover [20].

85 The morphology of the plains on the coast of Lampung Bay is interpreted
86 as various formations ranging from old to young sedimentary rocks. These rocks
87 are formed by sediment transportation from land to the coast, mixed with
88 sedimentation in the marine environment [18, 21]. Early sedimentation resulted
89 in the Tarahan Formation (Tpot), which covers a large area of bedrock in
90 Bandar Lampung. The formation currently leaves outcrops in the west and east.
91 A large part is covered by the Lampung Formation (QTI) and the Young
92 Volcano Formation (Qhv). The Tarahan Formation (Tpot) is the bedrock cover
93 formed from pyroclastic deposition and Tertiary-aged clastic sediments,
94 composed of tuff, breccia, and chert. The Lampung Formation (QTI) closes the
95 Tarahan Formation in the Quaternary with pyroclastic composition, sand, and

96 clay. The last phase is covered by pyroclastic from Mount Betung in the west to
 97 form the Young Volcano Formation (Qhv). Coastal alluvial deposits (Qa) also
 98 make up the coastal part. The coastal alluvial formation combines clastic
 99 material transportation on land to the coast and a marine sedimentation system.
 100 Geological order that lasts from Pre-Tertiary to Quaternary and the presence of
 101 hard rocks in the form of metasediment and igneous rocks [18]. This order
 102 strongly influences the alignment and geometry of the aquifer on the coast of
 103 Bandar Lampung.



104

105 **Figure 1** The geological map on the coast of Bandar Lampung [20]. The black
 106 dot represents the VES resistivity measurement data. In contrast, the red line represents
 107 the electrical resistivity tomography (ERT) measurement line.

109 The use of the geoelectric method aims to determine the distribution of
110 physical parameters in the form of resistivity of the subsurface layer through the
111 injection of electric current on the surface [22]. The resistivity of geological
112 materials varies with the type of rock, the constituent minerals, and the fluids in
113 the rock [23, 24]. It is allowed to be studied through the distribution of
114 geoelectrical data. The presence of fresh water and saline water fills the
115 porosity, causing the aquifer to be conductive. Saline water is more conductive
116 when compared to freshwater, so there will be differences in the resistivity
117 values of rocks saturated by the two types of fluids. In addition, the use of
118 Electrical Resistivity Tomography (ERT) in four paths aims to map the presence
119 of aquifers and the effect of saline water filling the pores. The Vertical Electrical
120 Sounding (VES) data distribution is used to get deeper information. Another
121 objective is to find the linkage of coastal aquifers with parts farther inland. All
122 geoelectric measurements were carried out using the ARES GFZ instrument.

123 ERT is an acquisition technique that is quite detailed in measuring
124 resistivity through lateral and vertical data distribution. The distribution of
125 tightly organized data will be able to image the subsurface profile in more detail.
126 The ERT profile is obtained by inversion of the measured data and converted
127 into actual resistivity using the Res2DInv programs [25, 26]. In this study, ERT
128 investigations were carried out in 4 coastal passes to map aquifers and the
129 presence of seawater intrusion accurately. Measurements using the Wenner-
130 Schlumberger array with an electrode distance of 6 m and a track length of 160
131 m.

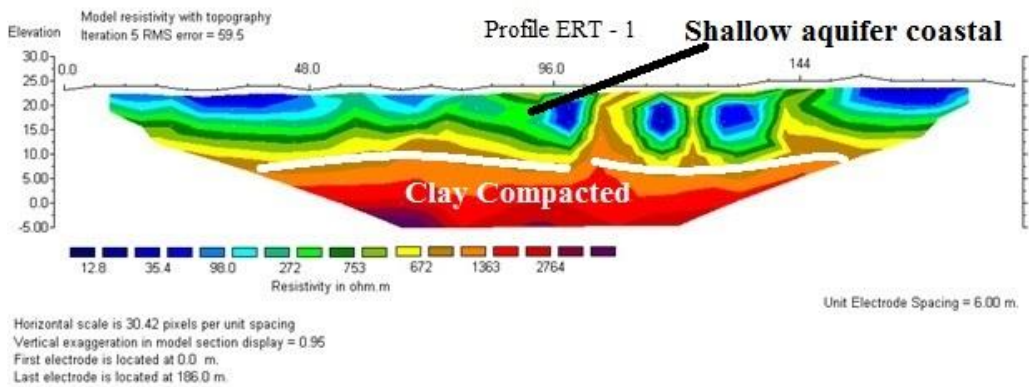
132 VES measurements provide the advantage of examining resistivity
133 changes vertically [27, 28]. The measurement technique uses the Schlumberger
134 configuration with potential electrodes (M and N) in a relatively fixed position,
135 and the current electrodes (A and B) are placed symmetrically on the outside of
136 the potential electrode. The M and N electrodes' positions are changed when the
137 current electrodes are farther away. Wider positions of the current electrodes
138 result in a decrease in potential difference, which causes a decrease in the
139 accuracy of the measurement data [29]. Data acquisition was carried out with
140 half current electrode spacing ($AB/2$) ranging from 1 m to 200 m in coastal
141 areas caused by open space constraints. There are 6 VES points to examine
142 aquifers on the coast, while 8 VES points are away from the coast (Figure 1).
143 VES data modeling was carried out to obtain resistivity values and the thickness
144 of the constituent layers using Resty software. The interpretation of resistivity
145 and thickness of the layers that make up the ERT modeling results with VES
146 data can produce information different from the actual subsurface geological
147 conditions. To reduce these problems, soil Penetration Test (SPT) analysis was
148 carried out at four drilling points located in coastal areas. This analysis serves as
149 a binder of the resistivity value of the modeled layer with the actual subsurface
150 constituent.

151 *2.3. Mapping of groundwater salinity*

152 Mapping groundwater exposed to seawater intrusion in the Bandar
153 Lampung Coast was randomly carried out according to community wells
154 availability using the Wal front EZ 9909SP water quality meter instrument. The
155 sampling method is carried out directly on the well and placed in the measuring
156 container. Measurements of water salinity values were also directly carried out
157 on water samples in measuring containers at the sampling location of 60
158 samples. The value of the measurement results is then recorded in a notebook
159 accompanied by information on the coordinates. All water sample measurement
160 data was carried out at the end of the dry season, namely in August 2021. The
161 measurement results were mapped to show the distribution of groundwater
162 salinity values, as shown in Figure 8.

163 **3. Results and Discussion**

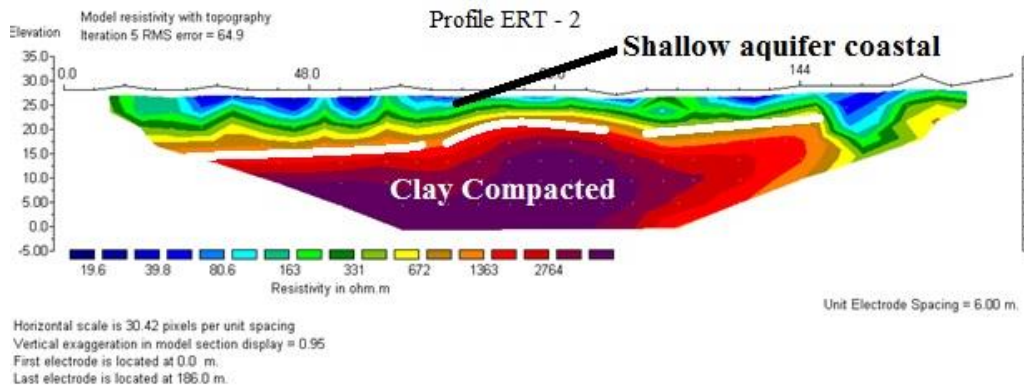
164 The results of mapping the closest aquifer to the coast in detail based on
165 electrical resistivity tomography (ERT) in four tracks and the results of the
166 inversion using Res2DInv are shown in Figures 2 to 5. The ERT profiles in
167 Figures 2 to 5 results are in line with the composition of the geological material
168 found in Table 1. Prospects of groundwater are at a depth of 2 – 24 m. The
169 aquifers are marine sedimentation composed of interbedding sand, silt, and clay
170 with coral reefs. The four ERT profiles were unable to distinguish in detail the
171 interbedding sand, silt, and clay with coral reef. These were read as one
172 conductive layer with a resistivity value of 10 – 70 ohm m. However, the
173 influence of saline water that fills the aquifer produces a resistivity value of 9 -
174 20 ohms m.



175

176

Figure 2 ERT profile on line 1



177

178

Figure 3 ERT profile on line 2

179

The existence of a resistive layer with a value of 800 – 3000 ohm m

180

symbolized by red in the four ERT profiles has been an unsolved problem for a

181

long time. However, drilling results at four SPT points provide essential

182

information on the presence of claystone basements on the coast of Lampung

183

Bay. The resistive layer was initially interpreted as pre-tertiary age bedrock

184

(Pzgs) undergoing accretion in the eastern part, as shown in Figure 1. However,

185

the drilling results indicated the presence of a claystone layer as a constituent of

186

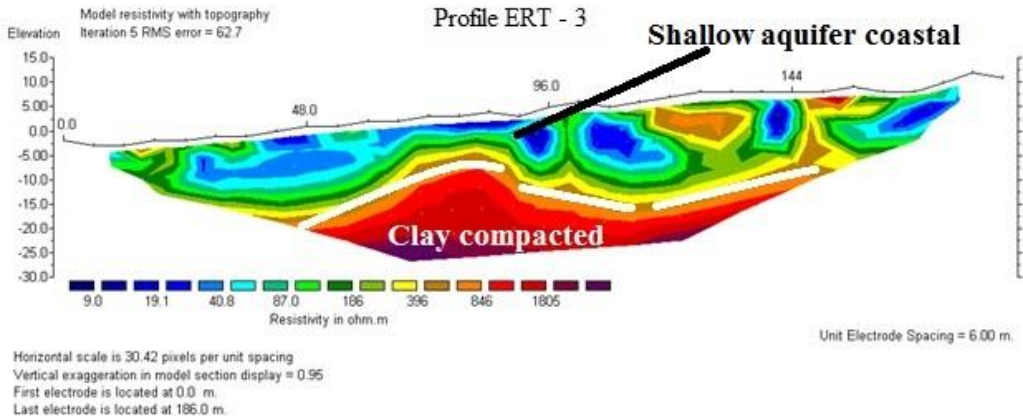
the Lampung Formation (QTI). The compressive test results on this claystone

187

layer have an N-SPT value of 60, which is strengthened by the difficulty of the

188

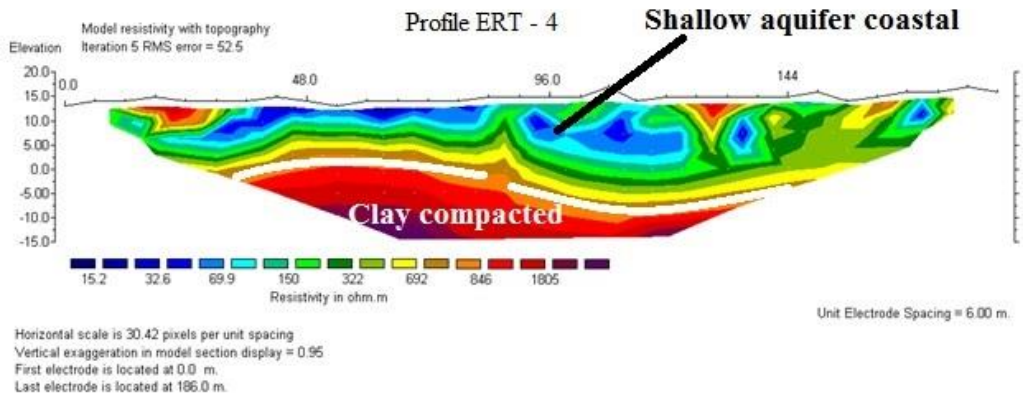
drilling process to penetrate this layer.



189

190

Figure 4 ERT profile on line 3



191

192

Figure 5 ERT profile on line 4

193 The interpretation of the ERT profile (Figures 2, 3, 4, and 5) refers to the
 194 drilling data at SPT-1, SPT-2, SPT-3, and SPT-4 with the results presented in
 195 Table 1. Conductive layers with a thickness of up to 24 m are interpreted as a
 196 product of shallow marine sedimentation formed during the Holocene period,
 197 which resulted in the Coastal Alluvial Formation [21]. The existence of coral
 198 reefs is a reinforcement for sedimentation on the continental shelf with a tropical
 199 climate on the coast of Lampung Bay. The thickness of the aquifer on the coast
 200 of Lampung Bay will vary by the influence of ocean current circulation, which

201 produces sand, silt, and clay layers. As the base of the alluvial formation,
 202 claystone is composed at a depth of 24 m on land (in SPT-1, SPT-2, and SPT-4)
 203 and 30 m in the sea (SPT-4).

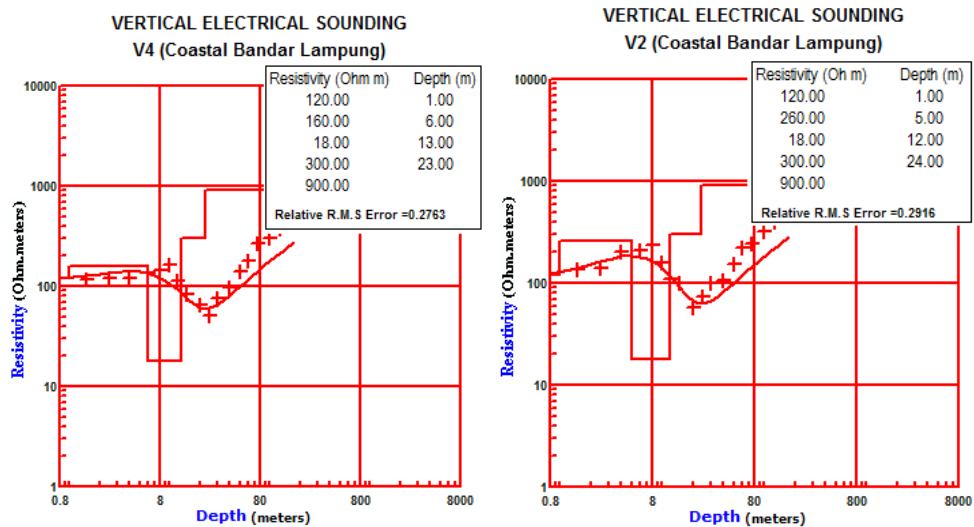
204 Table 1. Subsurface geological materials on the coast of Lampung Bay

Location	Depth (m)	Composed	Location	Depth (m)	Composed
SPT-1	0 - 1	Soil	SPT-3	0 - 14	Seawater
	1 - 3	Sand and coral reef		14 -30	Interbedding sand, silt, and clay with coral reef
	3 - 21	Silt and clay with lenses igneous rock		30 - 36	Claystone from Lampung Formation
SPT-2	0 - 2	Soil and clay	SPT-4	0 - 3	Soil and clay
	2 - 24	Interbedding sand, silt, and clay with coral reef		2 - 24	Interbedding sand, silt, and clay with coral reef
	24 30	Claystone from Lampung Formation		24 30	Claystone from Lampung Formation

205

206 The results of the ERT on the coast of Bandar Lampung are in line with
 207 the results of VES data modeling, which are shown in Figure 6. The presence of
 208 claystone indicates a thick basement which is the base for a thin layer of
 209 Alluvial Formation. In contrast, the VES model away from the coast (Figure 7)
 210 shows changes in the sedimentation environment, which are interpreted as

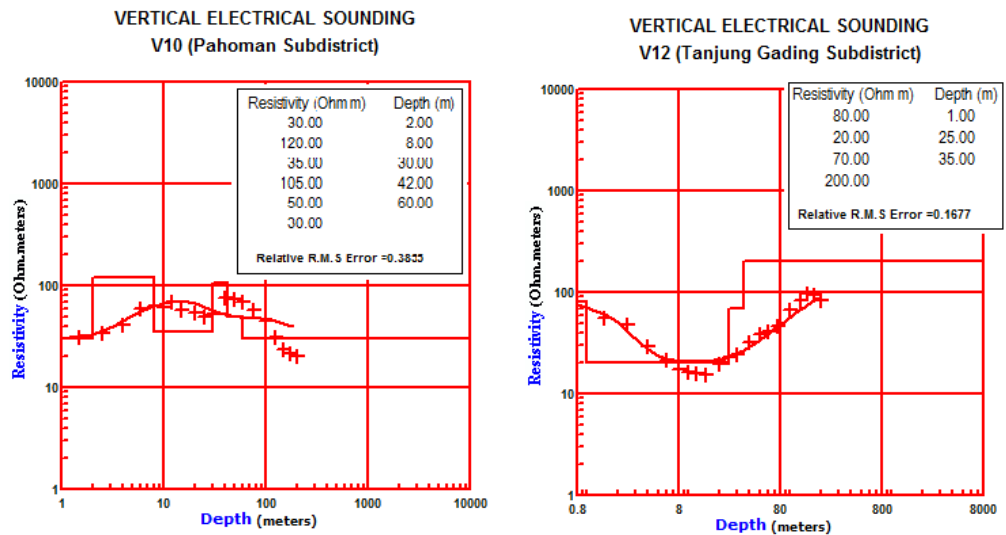
211 fluvial and flood plain environments. Aquifers away from the coast were found
 212 at varying depths, corroborated by the presence of wells that were 45 – 60 m
 213 deep and more than 100 m deep (Figure 1). The limitation of the depth of the
 214 drilling data is an obstacle to interpreting the alignment of the aquifers formed in
 215 the fluvial and flood plains in the Tarahan Formation (Tpot) and Lampung
 216 Formation (QTI).
 217



218
 219 **Figure 6** Interpretation of VES data at points V4 (left) and V2 (right) on the
 220 coast of Lampung Bay

221 A blue distribution as a conductive layer with a resistivity of fewer than 20
 222 ohms m was found in shallow aquifers in all ERT profiles and VES models. The
 223 results obtained from the four ERT profiles are corroborated by the measured
 224 salinity of groundwater test results from the well (black dot) with the
 225 distribution shown in Figure 8. Assuming that salinity greater than 500 ppm is
 226 interpreted as the threshold for groundwater mixed with seawater, a radius of 1.5
 227 km from the coastline has been contacting groundwater and seawater.

228 Meanwhile, in some subdistricts, seawater intrusion is located at a radius of less
229 than 1.0 km from the coastline.



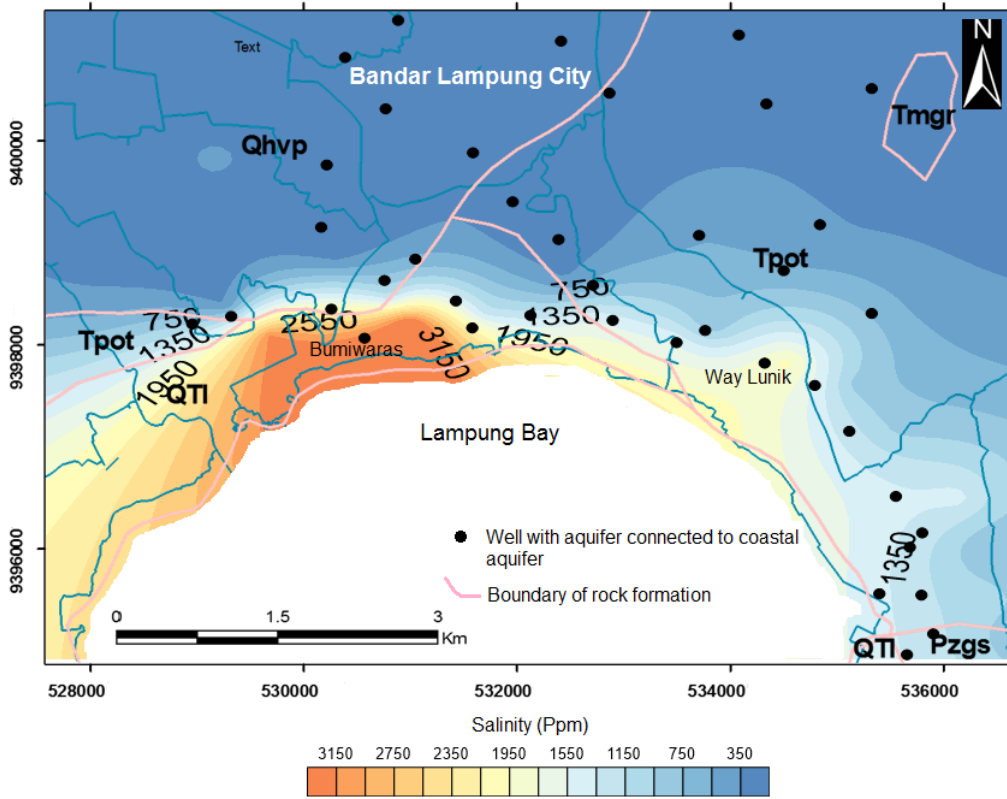
230

231 **Figure 7** Interpretation of VES data at points V10 (left) and V12 (right) on the
232 coast of Lampung Bay

233 Bumiwaras subdistrict is a zone with high contamination where the
234 measured salinity value reaches 3100 ppm. Meanwhile, the Way Lunik village,
235 with salinity in groundwater reaching 1500 ppm, takes second place. Bumiwaras
236 sub-district and Way Lunik sub-district are centers of trade, various industries,
237 and warehouses related to the presence of the port, causing an extensive use of
238 groundwater. These results indicate that the high level of groundwater salinity in
239 Lampung Bay has reached a radius of > 1 km from the shoreline. These
240 conditions are mainly in the Bumiwaras sub-district and Way Lunik village. It
241 indicates that the groundwater intrusion zone has polluted the shallow
242 groundwater aquifer, following the ERT results on lines 1 and 3 (Figure 2 and
243 Figure 4). Those explain the low resistivity values up to < 10-ohm m in the
244 aquifer zone. This result is also consistent with the VES data at locations V2 and

245 V4 (Figure 6), which detects low resistivity values (18-ohm m) at a depth of 12
246 – 13 m. This finding is significant to previous studies, which stated that there
247 was a rate of land subsidence in this area [30].

248 Furthermore, groundwater testing results from wells away from the
249 shoreline managed to get a picture of the effect of seawater intrusion into more
250 distant lands. The well distribution with the aquifer at a depth of 45 – 60 m
251 (yellow point) and more than 100 m (red point) in Figure 1 is assumed to align
252 with the coastal aquifer. The results of salinity testing on groundwater samples
253 indicate that they have not been exposed to marine intrusion with a value less
254 than 200 ppm. However, groundwater extraction by household needs, and the
255 presence of hotels, can undoubtedly pose a threat to seawater intrusion further
256 inland. The distribution map of groundwater that has been exposed to seawater
257 intrusion (Figure 8) can be a baseline to see changes in exposure to seawater
258 intrusion in the future, especially in the Holo-Quaternary Formation. For further
259 research, it is necessary to study the infiltration capacity of the hills around the
260 Tmgr Formation (Figure 8). It is also needed to study groundwater flow from
261 the mainland to the coast, which can prevent seawater intrusion.



262

263 **Figure 8** Map of saline groundwater on the coastal aquifer of Lampung Bay.

264 **4. Conclusions**

265 Using the geoelectrical resistivity method through a combination of ERT
266 and VES and supported by lithological data from SPT measurements is very
267 good in mapping the thickness of the coastal alluvial formation in Lampung
268 Bay. The four ERT profiles accurately distinguish the basement between the
269 marine sedimentary and resistive layers. The coastal aquifer in Lampung Bay is
270 part of the Holo-Quaternary Formation layer, which is from a depth of 2 - 24 m
271 in the form of interbedded sand, silt, and clay from marine sedimentation.
272 Groundwater is only in shallow aquifers with a depth of fewer than 24 m but has
273 experienced seawater intrusion, which causes low resistivity values between 9 –
274 20 ohms m. The main factor for taking large amounts of groundwater is
275 indicated as the main factor causing seawater intrusion to have reached 1 - 1.5
276 km from the shoreline. The ERT results support this finding, especially in lines
277 1 and 3, which show low resistivity values up to <10-ohm m in the shallow
278 aquifer zone. VES data reinforce this result (point V2 and point V4), which
279 detects low resistivity values (18-ohm m) at a depth of 12 - 13 m.

280 The resistive layer composed of claystone is found as a constituent of the
281 Lampung Formation and becomes a basement in Lampung Bay. Claystone is
282 located at a depth of 24 – 80 m due to the interpretation of data from ERT, VES,
283 and four drilled points for soil mechanics analysis. The presence of very thick
284 claystone makes the prospect of groundwater on the coast of Lampung Bay in a
285 shallow layer with a depth of less than 24 m. Furthermore, it is necessary to
286 research the infiltration capacity of the hilly area and groundwater flows in the

287 fluvial aquifers and flood plains to the coast to reduce seawater intrusion
288 pressure.

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291 improving the original manuscript.

292 **References**

- 293 [1] Werner, A. D., Simmons, C. T. Impact of sea-level rise on sea water
294 intrusion in coastal aquifers, *Ground Water*, 2009, 47 (2), 197–204.
- 295 [2] Braga, A. C. D. O., Malagutti Filho, W., Dourado, J. C. Resistivity (DC)
296 method applied to aquifer protection studies, *Revista Brasileira de*
297 *Geofisica*, 2006, 24 (4), 573–581.
- 298 [3] Ntanganedzeni, B., Elumalai, V., Rajmohan, N. Coastal aquifer
299 contamination and geochemical processes evaluation in Tugela
300 Catchment, South Africa-Geochemical and statistical approaches, *Water*,
301 2018, 10 (6), 687.
- 302 [4] Kayode, O., Odukoya, A., Adagunodo, T. Saline Water Intrusion: Its
303 Management and Control, *Journal of Informatics and Mathematical*
304 *Sciences*, 2017, 9 (2), 493–499.
- 305 [5] Christy, R. M., Lakshmanan, E. Percolation pond as a method of
306 managed aquifer recharge in a coastal saline aquifer: A case study on the
307 criteria for site selection and its impacts, *Journal of Earth System Science*,
308 2017, 126 (5).
- 309 [6] Christina, G., Konstantinos, S., Alexandros, G., Dimitrios, K., Aikaterini,
310 K. Seawater intrusion and nitrate pollution in coastal aquifer of Almyros -
311 Nea anchialos basin, central Greece, *WSEAS Transactions on*
312 *Environment and Development*, 2014, 10, 211–222.
- 313 [7] Ding, F., Yamashita, T., Lee, H. S., Pan, J. A modelling study of seawater
314 intrusion in the liao dong bay coastal plain, china, *Journal of Marine*
315 *Science and Technology (Taiwan)*, 2014, 22 (2), 103–115.

- 316 [8] Giménez-Forcada, E. Space/time development of seawater intrusion: A
317 study case in Vinaroz coastal plain (Eastern Spain) using HFE-Diagram,
318 and spatial distribution of hydrochemical facies, *Journal of Hydrology*,
319 2014, 517, 617–627.
- 320 [9] Das, S., Maity, P. K., Das, R. Remedial Measures for Saline Water
321 Ingression in Coastal Aquifers of South West Bengal in India, *MOJ*
322 *Ecology & Environmental Sciences*, 2018, 3 (1), 16–24.
- 323 [10] Alfarrak, N., Walraevens, K. Groundwater overexploitation and seawater
324 intrusion in coastal areas of arid and semi-arid regions, *Water*, 2018, 10
325 (2), 143.
- 326 [11] Rustadi, Darmawan, I. G. B., Haerudin, N., Suharno, Setiawan, A.
327 Geophysical approach for assessment of seawater intrusion in the coastal
328 aquifer of Bandar Lampung, Indonesia, *IOP Conf. Series: Materials*
329 *Science and Engineering*, 2021, 1173, 1–8.
- 330 [12] Bouderbala, A., Remini, B. Geophysical approach for assessment of
331 seawater intrusion in the coastal aquifer of Wadi Nador (Tipaza, Algeria),
332 *Acta Geophysica*, 2014, 62 (6), 1352–1372.
- 333 [13] Kumar, D., Rao, V. A., Sarma, V. S. Hydrogeological and geophysical
334 study for deeper groundwater resource in quartzitic hard rock ridge region
335 from 2D resistivity data, *Journal of Earth System Science*, 2014, 123 (3),
336 531–543.
- 337 [14] Taylor, C. J., Alley, W. M. Ground-water-level monitoring and the
338 importance of long-term water-level data, *US Geological Survey*
339 *Circular*, 2001, (1217), 1–68.

- 340 [15] Wen, X., Wu, Y., Su, J., Zhang, Y., Liu, F. Hydrochemical characteristics
341 and salinity of groundwater in the Ejina Basin, Northwestern China,
342 *Environmental Geology*, 2005, 48 (6), 665–675.
- 343 [16] Supriyadi, Khumaedi, Putro, A. S. P. Geophysical and hydrochemical
344 approach for seawater intrusion in north semarang, Central Java,
345 Indonesia, *International Journal of GEOMATE*, 2017, 12 (31), 134–140.
- 346 [17] Bouderbala, A., Remini, B., Hamoudi, A. S. Geoelectrical investigation
347 of saline water intrusion into freshwater aquifers: A case study of Nador
348 coastal aquifer, Tipaza, Algeria, *Geofisica Internacional*, 2016, 55 (4),
349 239–253.
- 350 [18] Barber, A. J., Crow, M. J. Structure of Sumatra and its implications for
351 the tectonic assembly of Southeast Asia and the destruction of
352 Paleotethys, *Island Arc*, 2009, 18 (1), 3–20.
- 353 [19] Metcalfe, I. Palaeozoic-Mesozoic history of SE Asia, *Geological Society*
354 *Special Publication*, 2011, 355, 7–35.
- 355 [20] Wilson, E. M. *Engineering hydrology*. 3rd Ed. United Kingdom: Palgrave
356 Macmillan, 1983.
- 357 [21] Mangga, S. A., Amirudin, Suwarti, T., Gafoer, S., Sidarto *Geological*
358 *Map of Tanjungkarang, Sumatra*. Bandung: Bandung: Geological
359 Research and Development Centre, 1993.
- 360 [22] Ugwu, S. A., Nwankwoala, H. O. Geo-electrical Evaluation of the Effects
361 of Waste Dump Sites on Groundwater in Eneka , Rivers State , Nigeria,
362 2015, 1 (5), 294–301.
- 363 [23] Montaña, J., Candelo, J., Duarte, O. Sand's electrical parameters vary

- 364 with frequency | Variación de los parámetros eléctricos de la arena con la
365 frecuencia, *Ingenieria e Investigacion*, 2012, 32 (2), 34–39.
- 366 [24] Pandey, L. M. S., Shukla, S. K., Habibi, D. Electrical resistivity of sandy
367 soil, *Géotechnique Letters*, 2015, 5 (3), 178–185.
- 368 [25] Dahlin, T., Zhou, B. A numerical comparison of 2D resistivity imaging
369 with 10 electrode arrays, *Geophysical Prospecting*, 2004, 52 (5), 379–
370 398.
- 371 [26] Sathish, S., Elango, L., Rajesh, R., Sarma, V. S. Application of Three
372 Dimensional Electrical Resistivity Tomography to Identify Seawater
373 Intrusion, *Science And Technology*, 2011, 4 (I), 21–28.
- 374 [27] Mohamaden, M. I. I., Abuo Shagar, S., Allah, G. A. Geoelectrical survey
375 for groundwater exploration at the Asyuit governorate, Nile Valley,
376 Egypt, *Journal of King Abdulaziz University, Marine Science*, 2009, 20
377 (1), 91–108.
- 378 [28] Mohamaden, M. I. I., Ehab, D. Application of electrical resistivity for
379 groundwater exploration in Wadi Rahaba, Shalateen, Egypt, *NRIAG
380 Journal of Astronomy and Geophysics*, 2017, 6, 201–209.
- 381 [29] Xu, Z., Hu, B. X., Ye, M. Numerical modeling and sensitivity analysis of
382 seawater intrusion in a dual-permeability coastal karst aquifer with
383 conduit networks, *Hydrology and Earth System Sciences*, 2018, 22 (1),
384 221–239.
- 385 [30] Zaenudin, A., Darmawan, I. G. B., Armijon, Minardi, S., Haerudin, N.
386 Land subsidence analysis in Bandar Lampung City based on InSAR,
387 *Journal of Physics: Conference Series*, 2018, 1080 (1), 1–7.

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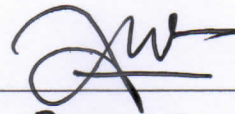
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Identification of Saline Water Intrusion Using Integrated Geoelectrical Method in the Coastal Aquifer of Holo-Quaternary Formation, Lampung Bay



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Abstract

Increased groundwater extraction from aquifers in Holo-Quaternary rock formations in Lampung Bay has caused saltwater intrusion. This indication appears in several community wells and can spread further inland. Therefore, this study aims to identify the distribution of areas exposed to saline water and the



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Q3 Environmental Science (miscellaneous) best quartile

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