

SELECTING THE COMMUNICATION CHANNELS TO DELIVER CLIMATE CHANGE INFORMATION FOR THE COASTAL AND SMALL ISLAND COMMUNITY IN INDONESIA

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Key words: information dissemination, climate change, coastal and small island community, Indonesia

Abstract. The communication channels influence the effectiveness of climate change information dissemination in achieving the goals. Previous researches measured the efficacy of several channels such as people, television, radio, web, documentary film, animation, and newspaper. However, none of them identified to find the appropriate channels. Finding the most effective channels is required since there is a limited budget to apply all channels. Accordingly, this paper aims to select proper communication channels for disseminating information about climate change for the coastal and small islands' communities in Indonesia. Then we surveyed by spreading questioners. Furthermore, we applied non-parametric tests Kolmogorov-Smirnov ($K - S$) for determining the kind of distribution of the data. The analysis showed that the distribution of data is not normal. Therefore we applied a non-parametric statistical test, Friedman test for determining the ranking of the channels. This research provides a recommendation in selecting appropriate communication channels to deliver climate change information for the coastal and small islands' communities in Indonesia.

Introduction

The climate change Information dissemination is required to increase the awareness and adaptation of people who are living in small islands. Periodically they are facing the dynamic of climates such as the sea-level rise and extreme weather events. As an archipelago with the second of the most number of small islands in the world as well as extensive coastal areas and densely populated country, Indonesia is vulnerable to any impacts of the climate change (Zikraa et al., 2015). Limited access to information has led to the low adaptability of

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communities in responding to the impacts of climate change (Bryana et al., 2009; Gentle & Maraseni, 2012; Heyhoe et al., 2007).

The impacts of climate change lead to the growth of the research in assessing the awareness and knowledge of the various group of community such as students (Tuna et al., 2011; Prasad and Suresh, 2016; Parant *et al.*, 2017), rural communities (Egbe et al., 2014; Kabir et al., 2016; Katikiro & Macusi, 2012), and decision-makers (Cvitanovic et al., 2014; Liu et al., 2016). The reduced level of the people's awareness and knowledge of those impacts of climate change lead to the research in finding the appropriate communication channel to deliver the information.

Previous researches generally aim at exploring the channels or media for climate change information dissemination. Indeed, it should be more useful using all various communication channels; therefore, there will reach large people. Since there is a limited budget to develop all kinds of the channel, it is necessary to find out which communication channel fits well for a particular group of community. There is a gap concerning the appropriate media in conveying the information to increase their awareness and knowledge. This research is relevant to develop an effective, efficient, and structured program in disseminating information to people who are living in the coastal and small islands. Therefore, this study intends to rank several communication channels to deliver information for the people of the coastal and small islands in Indonesia.

Table 1. Various kinds of communication channels to convey climate change information to people in rural

Communication channels	Sources
People (Officer/advisor/community/teacher)	(Abegunde, 2017; Egbe et al., 2014; Ngigi et al., 2017; Osagbemi et al., 2010; Syomiti et al., 2015)
TV	(Osagbemi et al., 2010; Syomiti et al., 2015; Zhang, Xu, & Yuan, 2011)
Movies/video/3D animation	(David et al., 2013)
Radio	(Abegunde, 2017; David et al., 2013; Egbe et al., 2014; Lemelin et al., 2010; Ngigi et al., 2017; Osagbemi et al., 2010; Teye et al., 2015; Zhang et al., 2011)
Newspapers	(Abegunde, 2017; Aggs, 2014; Lemelin et al., 2010; Ngigi et al., 2017; Reed, 2016; Syomiti et al., 2015)
Posters	(David et al., 2013; Zhang et al., 2011)
Internet	(Lemelin et al., 2010; Reed, 2016; Zhang et al., 2011)

In connection with those objectives, the research questions are the following: (1) What are the types of communication channel for conveying climate change information for people in rural? (2) How is the ranking of those communication channels? The results of this study are beneficial for the development of appropriate media for climate change information dissemination for the coastal and small island communities in Indonesia.

Literature review. There are several kinds of communication channels to convey information on climate change, among other people, television, radio, newspaper, poster, and the Internet. The types of communication channels to increase awareness, mitigation and adaption of people in rural to the climate change impacts have developed by several researchers. Table 1 shows the kinds of those channels.

1. Adapting to climate change in Indonesia

Studying local knowledge is one of the efforts to develop strategies to face the impact of climate change. Meanwhile, Retnowatia et al. (2014) suggested *Pranoto Mongso*, a seasonal calendar based on Western Gregorian, solar system, calendric system and the Javanese astronomy as a media to increase understanding of people regarding unavoidable impacts of climate changes such as rising temperatures, high intensity of rainfall and more prolonged period of the dry season. Larsen et al. (2012) suggested mapping 'sense-making perspectives', which enables an analysis of the multiple ways of the case study researches. The map is to support local climate adaptation and link such efforts to the higher level of public policy. Frimawaty et al. (2013) analyzed the index and sustainability status of rice farming systems in facing food security and climate change carried out by farmers in Jambi Province, Indonesia.

Radio is one of the communication channels employed to improve the adaptation of farmers and fishers to climate change impacts in Indonesia. Abdurrahim (2012) conveyed the spread of climate change information via radio to the farmers and fishers in the five districts in Indonesia, i.e., *Indramayu, Jakarta Utara, Batu, Serdang Bedagai, and Bau-Bau*. The socialization aims to improve the mitigation and adaptation to climate change impacts. However, the usage of the tool has not been optimal yet since the limited number of farmers and fishers listening to the radio and inappropriate content of the information broadcasted (Hidayati, 2012).

Identifying the problem and improving the local people's capacity are issues to enhance the adaptation of people to climate change impacts. Bohensky et al. (2015) identified a problem of the stakeholders who concerned about climate change in the province of West Nusa Tenggara (NTB). They had trouble in accommodating and integrating the cultural diversity and the different goals among them. Meanwhile,

Widiyanti and Dittmann (2014) developed the capacity of the local community at karst area in Pacitan, e.g., planting cultivars resistant to drought (cassava, maize, soybean, and groundnut) or doing multi-cropping between those cultivars, and planting rainwater harvesting and artificial aquifer. Some researchers researched forest fires in Indonesia, such as conducted by Herawati and Santoso (2011). In the meantime, Suroso and Setiawan (2013) applied risk management to plan the climate change adaptation program.

Several researchers studied the implication of the tourism industry on water availability. Sugiyarto and Sinclair (2003) conveyed that the Indonesia tourism industry improves macroeconomic performance and the welfare of society. However, issues regarding water supply and sanitation become obstacles in promoting Indonesian tourism (Cole, 2012). Nicholls (2004) led that tourism would have negative implications on water resources for small islands, coastal zones, and mountainous regions. On the contrary, previous researches argued that tourism industry could be a part of the solution to the negative impacts caused by the climate change (Belle & Bramwell, 2005; Cole, 2012; Garratt, 2007; Law et al., 2016; Simpson et al., 2008; Sutawa, 2012).

2. Methods

The steps of this research are the following: Firstly, we conducted a literature review to identify kinds of communication channels to convey climate change information. Afterward, the survey with questionnaires was developed to exam the ranking of those channels. We employed the readability test of the forms. This test is to review that the respondents and researchers have a similar understanding of questions. The respondents answered on the *Likert scale* from 1-5. Then we measured the normality of the data distribution using a K-S test.

Meanwhile, Cronbach's Alpha value must be greater than 0.7 as a condition for the fulfillment of the questionnaire's reliability. The last the *Friedman test* was applied to rank the channels. We conducted this research in 2012-2013.

The respondents are dwellers living in the island city of *Batam* and the district of *Kepulauan Seribu*, Indonesia. The reason for choosing those places is the number of differences in the aspects of geology, geography, and employment. These differences affect the exposure and vulnerability aspects of the region and its people under the threat of danger, especially problems related to extreme natural events or ones triggered by people's activities. *Kepulauan Seribu* Regency represents islands with a low lying coastal and close to the capital city. Meanwhile, the city of *Batam* represents island with undulating terrain, hilly morphology, and forest's cover coastal, and classified as an outermost region.

The respondents are natives and immigrants, both men and women, who had lived more than five years in the area of testing and are aged 17 years or over. The

locus of the district of *Batam* is a coastal village, namely *Batu Besar*, with the total number of inhabitants is 17.374 (Anonim, 2014). Meanwhile, the locus of the district of *Kepulauan Seribu* is several islands, namely *Pramuka*, *Panggang*, and *Pari* island, with the total number of inhabitants is 6766 (Utomo, 2015). We separated questioners proportionally, i.e., 50 questioners in the city of *Batam* and 20 questioners in the *Kepulauan Seribu* regency. The respondents were randomly selected. We received 38 forms from the district of *Batam* and 20 from the region of *Kepulauan Seribu*.

3. Finding

Batam's coastal community has fewer fishers than the population of *Kepulauan Seribu*. The percentage of the businessman in *Batam* is higher than the rate in *Kepulauan Seribu*. These data illustrate that some coastal communities have switched their professions. The people, who once were a fisher, have become a businessman. At least for the last 5-6 years, very rapid development in *Batam* has absorbed services and industrial labor in the city, increasing the number of immigrants who settle on the coast. Although *Batam* Island has vast lands and hills, living on the beach is still an option for immigrants. It is caused by not affordable for those with an income of less than 5 million Rupiah (=346.83 USD). The average salary of most immigrants in *Batam* island is 69.37 - 208.10 USD per month (*"Penduduk Batam, 56 Persen Berpenghasilan Rendah,"* 2016).

Table 2. The result of the K-S test

The communication channels	N		Mean		SD		Asymp. Sig. (2-tailed)	
	1	2	1	2	1	2	1	2
People	38	20	3.66	4.25	.909	.716	.002	.000
TV	38	20	3.79	3.75	1.119	1.020	.001	.000
Documentary film	38	20	3.88	3.65	.354	.933	.030	.000
Movies/3D animation	8	20	3.24	3.10	1.076	1.165	.011	.000
Radio	38	20	3.61	3.20	.974	1.240	.000	.000
Newspapers	38	20	3.95	4.40	.804	.598	.003	.000
Posters	38	20	3.26	3.95	.891	.999	.022	.000

Notes: 1 = the district of *Batam*; 2 = the region of *Kepulauan Seribu*

In contrast to the *Kepulauan Seribu* community, there is no choice but to settle on the coast because the settlements are in the form of small islands. The

reclamation enlarged this part. As usually found in the restoration of the low-lying island, enlargement of the coastal plain uses massive coral mined from the reefs that rim the island. There are no building materials available, such as stones and woods, to build houses in the supratidal zone.

K-S Test. This paper did not test all kinds of communication channels, for example, applications/software. The reasons are that typically, the people in rural was uneducated, low incomes, and lack of the Internet signal. They tend to choose simple communications channels, such as people (Yoganingrum and Hantoro, 2015). Table 2 shows the result of the K-S test.

Table 3 shows that only eight respondents filled the question relating to Movies/3D animation. It indicated that most respondents have never known about the channel. The result of the K-S test shows that all values of asymp. sig (2-tailed) is under 0.05. It indicates that the data distributed unnormal. Then the Friedman test was applied to measure the ranking of the communication channels.

Table 3. The Friedman test results

The communication channels	<i>Batam</i>				<i>Kepulauan Seribu</i>			
	Mean rank and ranking	N	Cronbach alfa	Asymp. Sig. (2-tailed)	Mean rank and ranking	N	Cronbach alfa	Asymp. Sig. (2-tailed)
People	5.00 (2)	8	0.861	0.016	4.95 (2)	20	0.820	0.000
TV	4.25 (3)				3.85 (4)			
Documentary film	3.88 (4)				3.70 (5)			
Movies/3D animation	3.25 (5)				2.60 (7)			
Radio	3.19 (6)				3.03 (6)			
Newspapers	5.25 (1)				5.40 (1)			
Posters	3.19 (6)				4.48 (3)			

The ranking of the communication channels. Table 4 shows the value of mean rank. The table shows that the value of Cronbach's Alpha is more than 0.8 for both districts. It means that the data collected are reliable. The Friedman test is employed to rank the channels. The averages value of people and newspaper are

higher than 5 for both loci. It means that both channels are essential highly. The number of data in the districts of *Batam* is only 8. It is because only eight respondents answer all questions in the questionnaire thoroughly. The application cannot work for the missing data.

4. Discussion

A newspaper is a media of choice for both districts. The media also becomes a choice for increasing rural people's awareness of nutrition (Nothwehr et al., 2014) and health (Young et al., 2015). Printed sources are still the preferred information medium for the majority of farmers and people in rural, especially in developing countries. Currently, many kinds of digital media are produced and trusted as reliable media for disseminating information. However, rural people still preferred the conventional media since they had many limitations on Internet access, knowledge, and education.

Most developing and developed countries such as the US, Australia, and Japan use newspaper as a media to disseminate the information about climate change. Sampei and Midori (2009) showed that the continuous coverage of global warming in a press increased public concern for the issue in Japan. Unfortunately, they did not explain who the public is. Other research showed that a group of university students preferred textbooks as trustworthy sources for climate change information (Braten et al., 2011). Meanwhile, the group of farmers in Ethiopia, especially men, favored the newspaper as a source of climate change information (Regassa and Stoecker, 2014). Men farmers in Kenya also preferred newspapers (Ngigi et al., 2017). Syomiti et al. (2015) reported that all livestock feed and keepers in Kenya, who become respondents chosen the newspaper as an agricultural information source.

Other media of choice for conveying climate change impacts information are people. In Indonesia, people in rural preferred asking other people to find information on the environment, such as village heads, including officers, neighbors, and community leaders (Yoganingrum and Hantoro, 2015). The oral tradition became a part of the Indonesian communication culture for a long time ago. This culture was employed from generation to generation, primarily to communicate beliefs related to nature and the environment. Troll et al. (2015) showed that oral tradition was a powerful way to communicate ancient hazard mitigation among people who are living in the volcano slope of the Merapi Mountain. Therefore, equipping village heads, officers, and community leaders with sufficient knowledge about the impacts of climate change will help disseminate information.

The radio becomes the last choice of the respondents as a climate change information source in both districts, *Batam* and *Kepulauan Seribu* (Table 3).

Otherwise, the channels become a choice in the some countries, especially in Africa such as Kenya (Ngigi et al., 2017), Ghana (Teye et al. 2015), Nigeria (Egbe et al., 2014) (Abegunde, 2017), and Namibia (David et al., 2013). Radio had obstacles as a media for disseminating climate change information in Indonesia. It caused by the limited numbers of people who heard the radio (Hidayati, 2012); just a few households had a radio (Yoganingrum and Hantoro, 2015) and the limited material broadcasted by the media (Hidayati, 2012). Applying radio is useful in areas where people usually listen to the radio (Hidayati, 2012). The usage of the radio should be followed by the collaboration between radio manager and the related stakeholders such as the district government, Agent for Meteorology, Climatology, and Geophysics (BMKG), and other radio managers (Yogaswara, 2012).

Conclusion

Information on the impacts of climate change should be disseminated widely. The use of various types of information media is required to reach as many residents as possible. However, limited funds and personnel need to choose the appropriate media. Newspapers and peoples are the media of choice of community in the case of the district of *Batam* and *Kepulauan Seribu*. However, other media needs to be developed. Therefore any people can reach information on the impacts of climate change.

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