Disaster resilience measurement in Padang's hotel sector

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Abstract. Padang city is the administrative center of West Sumatra Province, which is located in a zone of high-level danger from the earthquake and tsunami. It has many tourist destinations. To support the growth of the tourism sector, lodgings like hotels are needed. Besides, hotels are also used for Meetings, Incentives, Conferences, and Events (MICE) by private groups and government. Currently, the disaster resilience program is being promoted both for community, agencies, and the private sector. Disaster Resilience Framework for Hotels (DFRH) is a concept of measuring disaster resilience based on six categories of predictor capital groups, namely: social, economic, human, physical, natural, and cultural. The measurements were made by distributing questionnaires to staff and managers at three large hotels in the city of Padang. The data obtained were processed using (DFRH). For the level of hotel disaster resilience measurement from the staff side, the average agreement is 82%. Then from the manager's point of view, the measure of total agreement obtained by 86%.

1. Introduction
West Sumatra is one of the regions in Indonesia, which has a very complex geological order. This condition is due to its location in the collision area of two massive tectonic plates, namely the Indo-Australian Plate in the South and the Eurasian Plate in the North, which is marked by the presence of tectonic earthquake centers in the Mentawai Islands Regency and its surroundings [1]. Historically, Padang city has experienced several earthquakes and tsunamis. Some major earthquakes recorded in Padang city occurred in 1833 with a magnitude of 8.6 - 8.9 on the scale richter and in 1797 an earthquake and tsunami were estimated to occur with a strength of 8.5 - 8.7 on the scale richter [2]. The latest is the earthquake that occurred on 30 September 2009 with a magnitude of 7.6 located in 57 km southwest of Pariaman City which caused the destruction of Padang City's infrastructure by 25 percent, DIBI BNPB claimed 383 lives and lost 2 people. Based on data from the DIBI BNPB, the earthquake on September 30, 2009 caused total death from all affected areas was 1,195 people.

As a result of this earthquake, various infrastructure facilities in the city of Padang were damaged, this included aspects of formal and non-formal such as education, health, offices, public roads, bridges, irrigation, house of worship, markets and others. Including one of them is a hospitality facility. The safety factor is certainly an important consideration for the hotel considering that Padang City is in a disaster-prone condition. Data from Association of Indonesia Hotels and Restaurants (IHRA) of West Sumatra as a result of the earthquake on 30 September 2009, about 80 percent of hotels were severely damaged.

On a different interview occasion, Mr. Elfis Syarif from (IHRA) stated that after the last earthquake, hotels had been more aware of disaster safety and resilience, especially after Padang city was struck by an earthquake 10 years ago. One example of the application that has been carried out by
the hotel include: the provision of hydrants, fire simulations, direction signs for evacuation inside the hotel, notification of evacuation routes and HSE training. In this measurement there are six categories of modal predictor developed for DFRH where these predictors will be the basis for knowing and investigating the components of disaster resilience. This study uses a questionnaire survey directly addressed to managers and hotel staff in the city of Padang. The three hotel with 4 – stars classification title are located in the red zone lane with a location that is quite close to the beach.

Disaster Resilience Framework for Hotels (DFRH) consist of several framework that is used in the form of six different predictor capital or aspects as a basis: social, economic, human, physical, natural and cultural. The six predictor capitals will be broken down again into endurance predictors. This measurement was developed from a variety of literature and experience from the hotel industry itself [3].

2. Disaster resilience

The frequency of natural disasters has increased in recent times. This makes us aware of the importance of preparedness and resilience to disasters so that they can recover quickly after unexpected changes due to disasters [4]. According to [5] livelihood assets consist of 5 capital, namely: Human capital, consists of skills, knowledge, ability to work and good health. Social capital consists of networks, connections, group membership and relationships of mutual trust. Natural capital, natural resource reserves, where these resources come from and how to obtain them. Consists of forests, land, sea water, protection from storms and erosion. Physical capital, basic infrastructure and producer goods needed to support livelihoods. Consists of affordable transportation, safe shelter, access to information and adequate water supply and sanitation. Financial capital, consists of savings, credit, and other cash inflows that generate income.

2.1. Disaster resilience framework for hotels

Disaster Resilience Framework for Hotels abbreviated as DRFH is adopted from [3] and used as a design for exploratory survey questions, which consider disaster resilience in the context of capital including economic, social, human, physical, natural and cultural resources. These measurement steps are developed from the literature and experience of the hotel industry. Predictors for economic capital include income diversification, financial strength, availability of resources and economic resilience of staff. In social capital, the predictors are social relations and cohesion, capacity to work as a group and trust. Human capital is a predictor of health, ability, adaptive capacity, knowledge and business sustainability topics. To determine predictors of physical capital from life safety and business sustainability including the physical structure of buildings, codes or signs on buildings and evacuation routes. Surveys based on natural capital have environmental-based risk predictors and hotel impacts to the environment. The next predictor relates to cultural capital in the form of cultural knowledge and cultural influences on the social system

The main function of this framework is to identify predictors of disaster resilience which can be interpreted in terms of hotel strength and potential gaps. The existing framework is flexible so that it provides opportunities for hotels that want to increase their resilience to disasters by adjusting strategies based on the capacity of the hotel [3].

3. Methods

This study uses the DRFH's predictor as a basis for quantitative exploration of the hotel sector in Padang city. GM Hotels and staff were surveyed to determine the existence of this prediction tool. The next section will provide more information about the participant, research area and other important things.

3.1. Research area

Preliminary studies were carried out at BPS of Padang city, BNBP of West Sumatra Province and IHRA West Sumatra. The purpose of this initial research is to get information about the disaster in the
hotel sector, disaster data in 2009, an understanding of the hotel sector in Padang city. After several findings in BPS of Padang city, number of hotels in this city according to the data [6] are shown to Table 1.

| Classification | Total |
|----------------|-------|
| 4 – stars hotel | 7     |
| 3 – stars hotel  | 6     |
| 2 - stars hotel  | 9     |
| 1 – star hotel   | 8     |
| Non - star       | 47    |

From seven hotels in 4 – stars hotel classification, only 3 hotels gave permits and others refuse for reasons that cannot be mentioned. These 3 hotels have carried out hotel business certifications (classification and re-classification) by business certification bodies. 4 – stars hotel by [6] means an attempt to provide lodging, food and drink services and other services to the public by using part or all of the room. This business is managed commercially and fulfills the requirements as a four-star hotel as stipulated in the decision letter of the agency responsible for developing it.

3.2. Participants
The total population of these three hotels is 347 people. The size of the sample can be calculated using the Slovin formula [7] and the minimum number of samples needed is 78 samples. Proportionate sampling means the number of each stratum in the sample is proportional to the sum of each stratum in the population [7]. So, that each hotel receives that questionnaires consisting of 31 participants, 25 participants and other hotel is 22 participants. The questionnaires distributed to the GM and staff directly with GM's responses totalled 3 of the 3 hotel properties and the staff responses totalled 78 of the 3 hotel properties. In conclusion, all respondents gave feedbacks for the questionnaires.

3.3. Survey instrument
Descriptive exploratory survey design was adopted from [3]. Some of questions has been adapted and changed to the condition of Padang city without reducing the purpose of the question. This is because there are some questions that cannot be asked to participants in Padang city. There are 32 questions for staff and 38 questions for GM. This study used multiple choice with five point Likert scale, with scale 1 for strongly disagree and scale 5 for strongly agree. This determination has meaning [3] agreement indicated the presence of the capital predictor, while disagreement indicated the hotel had not applied the predictor from that capital, or that predictor was not present. The distribution and collection of questionnaires was carried out for one month.

4. Survey results
The data below is described with descriptive statistic. Based on survey result it is know that the majority of respondents are male. This can be seen from the percentage for male is 65%. Total of 81 respondents, 53 of them were men and the rest were women. The duration of the respondent's experience in the hospitality industry varies, ranging from 1 year - 20 years, with an average length of 8.42 years. Also the average respondent's residing in Padang city is 20.14 years. The next subsection will show the result of survey from staff and GMs. Most of predictors in disaster resilience framework for hotel shown positive comment.
4.1. Economic capital

Figure 1. Economic capital predictors for GMs.

For managers there are economic issues regarding the hotel and hotel customers. From the results of a geographical survey of economic capital to the manager, it is known that the profit and guest base are rated 100% agreement.

Figure 2. Economic capital predictors for staff.

From the results of the respondents' answers above, the total of respondents is known that the monthly income allowance and the existence of insurance costs dependents with a percentage of 91% and 89% agreement.

4.2. Social capital

Figure 3. Social capital predictors for GMs.
In the form of a questionnaire index distributed to hotel managers for social capital. The lowest majority agreement is 80% and reaches a maximum value of 100%. By this stated, we know that GMs are really appreciated with 93% agreement about the staff ideas and input. Beside that, 87% GMs agreed that in resolve problems will always take thoughtful actions. And the rest can be seen from the Figure 3 above.

![Figure 4. Social capital predictors for staff.](image)

The total agreement for social capital for staff is in a very good position because this is in the range of above 80% except listen or read news at least twice per week has agreement value of 77%. Every GMs plans is consistent with the staff's answer, such as hotel cooperates with other organisation, hotel's plan that can be work in disaster, and so on.

4.3. Human capital

![Figure 5. Human capital predictors for GMs.](image)
Based on human capital, the survey was agreed to be divided into several groups such as health and welfare, disaster management capabilities, ability to support, knowledge of disaster management and business continuity. According to GMs answers to the survey about human capital have as shown by Figure 5 above with the highest agreement of services provided to guests. And CPR training with 67%. But overall all predictor's from GMs point of view have good results.

![Total % Agreement](image)

**Figure 6.** Human capital predictors for staff.

Resilience to human capital in this study includes the skills, knowledge, ability to work and personal health of staff and managers. From the results of processing data according to the following Figure 6 it is known that the smallest percentage is CPR training, the majority is 40% and the biggest percentage is in the notification of information to guests regarding emergency safety procedures with 84% agreement.

4.4. Physical capital

On physical capital some predictors are based on: security of life and business sustainability. The questions for GMs and staff in physical capital are the same. The only differences there are two additional questions for managers such as: the hotel's critical systems and the local building codes. From the manager's answer, 3 questions have an agreement of 93% and other questions not less than 80%.
4.5. Natural capital

For natural capital, the questions given are the same between staff and GMs. At this capital the value of the recycling process at the hotel is less than other question.

From 3 out of 4 questions have a very good total % agreement that is above 80%, it's just that in question number 4 the agreement value is below 80%, so, this can be said that all question items on physical capital have been implemented both from staff side and GMs point of view.

**Figure 7.** Physical capital predictors for GMs.

**Figure 8.** Physical capital predictors for staff.
Predictors that contained in natural capital such as hotel exposure to the risk of natural hazards and the impact of the hotel's presence to the environment. From the results of the distribution of questionnaires regarding natural capital, many found neutral answers given by staff in the survey. The existence of the hotel had been considered with regard to the surrounding environment got 78% agreement. The hotel participate activity in recycling waste got 76% and the last predictor for physical capital which is evacuation from disaster if needed to the safe locations occupies the highest position of 85% agreement.

4.6. Cultural capital

The measurement of resilience in terms of cultural capital involves the length of stay in an area. This is because people who have long lived in certain areas have a strong connection to the area they live in due to of historical knowledge about events and all forms of risk that will help in building disaster resilience. From GMs side the total agreement is 80% and for teh staff is 84% total agreement.
5. Discussion
Resilience is a process that explains the public's response to external forces, such as economic decline, natural disasters or other threats to sustainability [8]. The main problem in economic capital that will affect if a disaster occurs is the issue of hotel finance. Based on the survey results, it is known that hotels have financial reserves that will become a resource in the event of a disaster. Economic capital becomes an important factor if businesses want to live again, because if disasters occur both due to natural and human factors, it takes a process for recovery, repair and re-operating costs that are not small. Insurance is the most standard and effective way to deal with risk. Basically, all parties will get the benefit, although for insurance users this can only be felt if there is a disaster that causes loss of life, injury, loss of property or declining health. From the information provided by the informants, it was found out that all staff received social security (insurance) known as BPJS or are currently known as labor and health care workers. Which is the whole procedure will be handled by hotel management, both sick, work accident and death will be covered.

Welfare can be intended with the savings from the provision of income in the hope of a stable economic results. From the survey results, the answers given by respondents about the allowance for income earned a value of 91% so that it can indicate if the staff has deposits from the salary earned. Nowadays, the market segment of a hotel is not only dependent on guests with purposes to enjoying their holiday in Padang city, but in terms of the Meeting Incentive Conference Exhibition (MICE) is far more beneficial for the hotel management.

Social capital in the results of the study showed good results, this can be seen from the results of the distribution of questionnaires to staff and GMs which showed that there was a sense of trust between the GM and the staff. The staff surveyed showed they had the ability to control themselves and circumstances. This awareness is certainly useful in the results of community participation in disaster resilience because there will be many people (guests) who do not understand and recognize the dangers of a place and do not know various measures to protect themselves. In addition, it is also owned if the hotel cooperates with parties such as firefighter, PLN and BAPEDALDA.

In human capital, the implementation of training related to disaster will affect the individuals involved in the training. Disaster preparedness from the hotel community can be seen from the training conducted by the hotel such as fire drills and earthquake simulations. From an interview with one of the hotel representatives, it is known that the hotel does have a disaster resilience program that is followed by all hotel staff. This can be seen with the formation of the HSE's team and the implementation of routine training (simulation), each hotel has different schedule. From the survey results, there is one hotel for chest compression training or known as CPR still in the process of discourse. Most of the staff know of this action through communication media not by specific training.

From the measurement results both from staff and GM stated the existence and provision of information to guests when a disaster occurs. Emergency safety information services for guests can be seen from the direction of the evacuation board which can be found in the hotel hallway and the rooms, also safety induction in every meeting that held at the hotel. In line with [9] the community required to have an emergency plan and make proactive actions for emergency preparedness. This preparedness plan contains plans to protect assets with guarantees of ownership, self, family, evacuation plans, communication, provision of livelihood supplies. This theory is justified by the existence of facilities such as fire extinguishers, fire hydrants, alarm bells, safety shoes, protective
clothing, smoke detector, heat detector and water detector to prevent fires in hotels, emergency stairs, assembly points and shelter for tsunami.

Physical capital resources for safety surveyed based on a good building standards and the availability of evacuation routes [10]. This study does not assess the standards of hotel buildings but only covers the license to erect buildings issued by the government. Lack of measurement for printed data can be caused by staff ignorance. This is because certain positions have handled the problem. This is proven by the results of interviews which state that more organizational data is handled by the front office division. The availability of backup power plants for hotels and the supply of water and food will certainly be very helpful for the hotel community to survive. According to the interview, the hotel provided a generator set which was controlled by the engineering division. Unfortunately, water and food supplies are also available, but the amount is not sufficient if a disaster does occur.

The process of analyzing the environmental impact has been considered by the hotel in the organization's policy. This is so important. So that, the community and the environment around the hotel do not get a bad impact either air pollution, noise pollution and liquid pollution. The recycling program has not been done yet. However, the hotel processes the waste properly. Such as "gray water" waste is processed in a special tank as much as 2 times filtering by fermentation process using bacteria so that the final can be used to watering plants. The kitchen waste treatment process is filtered with a grease strap which handled every day. The result of filtering the waste are fat and water. Water will be flowed directly into the city drainage while fat waste will be continued by BAPEDALDA.

The measurement of cultural capital for managers and staff is 80% and 84%. This is consistent with the theory from [11] that the risk of each person and family depends on the country they live in, the type of residence, where it is located and transportation. This can be cause the participants already know the historical traces of Padang city or know the potential disasters that could have happened because they have known the ins and outs of Padang city itself. This was acknowledged by staff and GMs who were followed by an average stay in Padang for 20 years.

6. Conclusion

The conclusion obtained by the Disaster Resilience Framework assessment method for Hotels has a value of 82% for hotel employees and 86% for managers. Where the average measurement of disaster resilience is 84%. Most of the hotel’s response, they already had safety information and did some simulaton and other emergency stuffs that could help if accident happened.. This 3 hotels also had shelter or assembly point for tsunami and earthquake. This research successfully identified the gaps and strengths of hotels in disaster resilience. Supporting factors that can be used as a strength for hotels can be seen from the cooperation with several organizations outside the hotel environment such as: firefighter, PLN and BAPEDALDA. The strengths and gaps highlighted in this study can be used by GMs to consider the next steps in building disaster resilience.

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