

PHILOSOPHY OF SCIENCE ANALYSIS IN STUDIES RELATED TO CLIMATE CHANGE IMPACTS ON THE RESILIENCE OF INFORMAL AREAS

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ABSTRACT

Climate change is a topic of discussion in various parts of the world. Several coastal cities in Indonesia are currently also threatened by the impacts of climate change. From several studies, it is known that the threat of climate change is considered capable of increasing community resilience in informal areas. This study aims to identify the application of the principle of verification of positivism and its implications as an analysis of the philosophy of science in the study of climate change impacts on the resilience of informal areas. The analytical technique used is descriptive evaluative by using several literature reviews and theories. From the results of the study, it was found that research related to climate change and resilience of informal areas is an empirical, logical, and measurable research as well as part of a deductive research and reflects that the theme of this research is a part of science.

Keywords: *Climate Change, Community Resilience, Philosophy of Science*

A. INTRODUCTION

Climate change is a global issue that has the highest potential for disaster in the world, especially in areas that have three main criteria, namely developing countries, archipelagic countries, and countries with large coastal areas (Sitadevi, 2017). Indonesia is one of the countries with a high level of vulnerability to climate change impacts (Fankhauser, McDermott, & Costa, 2016). Climate change is a form of change in climate elements outside the average habit. In this case, the symptoms of climate change can be observed by looking at the changes that occur in the trend of surface temperature and the trend of rainfall (Pratiwi, Asbi, & Kurnianingsih, 2022). The impact of climate change in the global dimension can have an impact in various regions, including urban centers located in coastal areas, which have densely populated areas with a fairly high level of vulnerability from the impacts of climate change (Mukhlis, Putri, & Purnawaty, 2011).

Efforts to mitigate and adapt to climate change disasters have actually been carried out by the local community and government through risk management at every stage. Seven characteristics of resilience can be defined based on the various efforts that have been made by the community and the government, the seven characteristics are Reflective, Resourceful, Robust, Redundant, Flexibel, Inclusive and Integrated. So that in fact the community already has the capacity to cope in the context of resilience in the face of various pressures and shocks (Ilmi, Asbi, & Syam, 2020a).

Informal phenomena in terms of the region also have a crucial role in the existence of cities in Indonesia. This seems to give a warning that there will be an increase in the number of people who are vulnerable to natural disasters, civil conflicts, and the impact

of climate change (Fankhauser *et al.*, 2016). The phenomenon of informal areas also gives an unfavorable impression on the face of the city, so that several times there are policies that tend to be rigid and unplanned, such as evictions and development that sacrifices people who live in informal settlements (Ilmi, Asbi, & Syam, 2021a).

Informal communities living in coastal areas have the same risk as the impact of climate change. Several previous studies have shown that people who live in disaster-affected areas tend to have a large adaptive capacity. This is predicted to be a solution to realize a disaster-resilient coastal city with high resilience in the future (Ilmi, Asbi, & Syam, 2020b). The characteristics of the existing informal areas are a worrying combination and can increase vulnerability, risk and impact of climate change. If we look at the vulnerability of informal areas such as inadequate housing conditions and accessibility or are slum settlements with livelihoods that depend on one sector and a weak economy with low incomes and do not have large enough assets and human behavior that can damage nature (Ilmi, Asbi, & Syam, 2021b).

The study and identification of communities has recently emerged as a significant research subject among sociologists and planners. Preliminary results that many of them still unpublished, suggest that the requisite empirical techniques are nontrivial, but however some are already in hand, and others are sure to be developed (Kuhn, 1974)

Therefore, studies related to the resilience of informal areas and the impact of climate change really need to be studied from the point of view of the philosophy of science in order to find out the relevance and implications through the application of the principle of verification of positivism, which is part of the analysis of the philosophy of science. The discussion will focus on the relationship between the impact of climate change on the resilience of informal areas in terms of the application of the positivism verification principle as part of the analysis of the philosophy of science.

The relationship between the philosophy of science is the main topic that will be discussed in this paper, considering the importance of the position of the philosophy of science in environmental science disciplines. In general, philosophy is a human effort to understand everything systematically, radically, and critically. Therefore, philosophy tends to be a process and not a product. The process carried out is critical thinking which includes active, systematic efforts, and following logical principles to understand and be able to evaluate information with the ultimate goal of determining whether the information is accepted or rejected. Thus, philosophy will continue to change dynamically until it reaches a certain point (Takwin & Martiasa, 2001).

By understanding the philosophy of science, one will be able to think systematically, radically, and critically. In research in the field of environmental science, a researcher is required to be able to criticize existing theories. So it is hoped that researchers will have a structured mindset in solving a problem. Based on the background that has been described, the purpose of this research is to apply the principle of verification of positivism and its implications as an analysis of the philosophy of science in the study of climate change impacts on the resilience of informal areas.

B. RESEARCH METHODS

Philosophy has an important role for a science, because in philosophy you can find views on many things (complexity, discussion and validity testing) as well as accountability for thoughts and ideas that can be justified intellectually and scientifically. (Bagir, 2005). The method in this study uses a descriptive evaluative technique approach, by describing the philosophy of science associated with the study related to climate change impacts on the resilience of informal areas. In this study, several secondary data were collected in the form of literature related to the philosophy of science, studies in the field of urban and regional planning, environmental science, as well as scientific writings that were downloaded as the main subject.

C. DISCUSSION

Methodology in the philosophy of science describes how researchers find knowledge. In brief, it can be said that the methodology asks questions about how a researcher finds knowledge, or asks questions regarding what methods are used to find knowledge. (Guba, 1990, p. 18). Mixed method research uses qualitative and quantitative approaches. The qualitative approach in this case study is used to obtain community perceptions of climate change and how it affects the resilience of informal areas. While the quantitative approach is used to translate the results of perception into the form of data and numbers. In addition, a quantitative approach will be obtained through data processing related to the increase in population and the area of informal areas based on data obtained in a time-series basis.

Because this case study is rational and perceptual, it is viewed as a positivism and post-positivism paradigm. Kuhn (1974) says that a paradigm is what the members of a scientific community, and they alone, share. Conversely, it is their possession of a common paradigm that constitutes a scientific community of a group of otherwise disparted. The position of positivism itself is classified as rational positivism because it has used a logical approach. This assumption is evidenced by the term resilience which is the result of comprehensive planning and is connected with a rational planning approach. Rational planning is the core of the area of urban and regional planning, according to Taylor (1998), in rational planning there are five important stages that must be carried out:

1. define problems and goals;
2. identify alternative plans and policies;
3. evaluate alternative plans and policies;
4. implement plans and policies;
5. monitoring plans and policies.

The five stages above must be carried out in order to be able to fulfill what is needed in a rational planning concept. If one of the stages cannot be fulfilled, a rational planning will not be created. For post-positivism in the case study, it is obtained from the results of community perceptions of the stimuli obtained from the impact of climate change and its impact on the resilience of informal areas. People give subjective opinions using their reasoning and feelings about the impact of climate change on their lives.

The quantitative method is believed to have originated from the philosophy of positivism introduced by August Comte, a philosopher who lived in the 18th century

(Ginting & Situmorang, 2008). In the view of positivism, the source of truth only comes from an empirical reality. Positivism does not recognize things that are outside of human empiricism. Positivism emphasizes that the object studied must be accompanied by facts and leads to certainty and accuracy. Positivism includes research that seeks to reach the truth or discover scientific theories. Research in this context can be understood as an epistemological process to reach a truth. Positivism does not contrast between inductive and deductive logic, but rather emphasizes empirical facts that are the source of scientific theories and findings (Ginting & Situmorang, 2008).

According to Ginting and Situmorang (2008) August Comte in *Scientific Metaphysics, Philosophy, Religion and Science*, 1963, which is considered the basic reference of positivism, introduced the "three-level law" of human intellectual development, namely the levels of theology, metaphysics, and positivism. Humans at the first level tend to refer to things that are natural, humans at the second level tend to refer to metaphysical powers, and humans at the third level tend to refer to scientific descriptions and laws. The means for conducting scientific studies include observation, comparison, experiment, and historical methods (Ginting & Situmorang, 2008).

On the other hand, the qualitative method is considered a contradiction of the quantitative analysis approach or the positivism of August Comte (Ginting & Situmorang, 2008). The opposition to positivism is itself a post-positivism. Post-positivism has the main characteristics as a modification of a positivism. Due to the many shortcomings of positivism, it causes post-positivism supporters to try to minimize these weaknesses and make adjustments. Prediction and monitoring remain the goals of post-positivism (Guba, 1990, p. 18). This paradigm arises from the flow that wants to improve the weakness of positivism which only relies on the ability to directly observe the object under study. Ontologically, this school is critical realism which views a reality as being in a reality, which is in fact in accordance with the laws of nature. But if a reality can be seen correctly by humans, it is classified as impossible (Salim, 2001, p. 40).

Based on the theoretical framework that has been described on the previous page, it can be said that mixed method research is a collaboration of positivism and post-positivism theory, especially in research that quite a lot makes humans the object of research, or research that relies on people's perceptions. So that the post-positivism approach becomes something that must be used if a study uses a method that requires a questionnaire as a tool. In case studies of research on the relationship between climate change impacts and the resilience of informal areas, valid results will not be obtained if the community is not used as a research variable, because it is closely related to the basic understanding of the community regarding climate change and resilience.

The community's point of view was chosen because in the informal area there are components of residence and work that focus on People Center Development. In various resilience studies, there are also many researchers who focus on communities and always use social aspects in assessing resilience both at the local and city levels so that in the end they can classify the level of resilience and what dimensions of resilience can then be intervened.

Referring to the City Resilience Framework (2015) document, by referring to the concept of resilience, the dimensions and elements for assessing resilience are obtained as follows:

- **Health & Wellbeing**, meet basic needs, both health and other things to get easy access to basic services needed by every community. Support livelihoods and jobs in the form of training and efforts that can ensure the availability of community needs and ensure health services and supporting facilities.
- **Economy & Society**, encourage cohesion and community involvement, with good social networks and integration encouraging citizens to be actively involved in planning and decision making. Get legal guarantees, prevention of criminal acts, and actions outside the applicable legal normative as well as good city economic management.
- **Infrastructure & Environment**, improve and provide protection both natural and man-made through infrastructure, effective land use planning and regulation. Environmental conservation maintains urban ecosystems that are included in good city management. Have and carry out ecosystem and infrastructure management as well as contingency plans. Environmentally friendly and sustainable communication and mobilization such as public transportation.
- **Leadership & Strategy**, good governance, the establishment of the government, the community, and business actors. Various stakeholders can formulate decisions together. Education for all, access to information and knowledge that is easily accessible to people and organizations to make decisions.

Based on the dimensions and elements above, it can be concluded that resilience is closely related to humans as an object, because resilience is also related to aspects of psychology and human perception. For example, the emotional, social, personal, and self-determination aspects which in this case study are expressed as variables are residents of informal areas. Therefore, a post-positivism approach is indispensable in the exploration of resilience studies. Furthermore, an analysis is carried out to see the position of the case study on the impact of climate change on the resilience of the informal area in terms of rationalism and empiricism.

Empiricism is a philosophical understanding that teaches that what is true is something that is logical and has empirical evidence. With the understanding of empiricism, the rules (to regulate humans and nature) were made. However, empiricism also has shortcomings, one of which is that this understanding has not been measured. Empiricism only comes to understanding general concepts (Tafsir, 2004). Empiricism also assumes that knowledge can be obtained through experience gained through the five senses (Kattsoff & Soemargono, 1992). From the statement above, it is known that the case study on the study of climate change impacts and the resilience of informal areas is reviewed in an empiricist approach, the researcher gives an argument based on experience and the results of the five senses that are captured, then raises what is called a hypothesis.

While the rationalism approach underlines that science comes from intellectual understanding which is built on logically constructed arguments. Therefore, the most important thing in the rationalism approach is sharpness in empirical meaning (Ginting & Situmorang, 2008).

Muhadjir (1989) and Ginting & Situmorang (2008) assert that intellectual understanding and argumentation skills need to be supported by relevant empirical data, so that the resulting scientific product based on rationalism, really appears as a science, not a fiction. In the rationalism approach, empirical facts are not only sensual things, but there are several things called empirical logic, empirical theory, and empirical ethics.

From the above understanding, it can be analyzed that case studies of the relationship between climate change impacts on the resilience of informal areas are analyzed according to a rationalism approach. The reason is because a research case study with a title like this is not only an understanding of sensory hypotheses, but is also based on empirical data. The data that is then processed include: (1) community perception data to determine the level of resilience which is then processed into numerical data through Principal Component Analysis (PCA); (2) the climatological data used to represent the impacts of climate change are presented in the form of graphs and figures based on the numerical data obtained.

In understanding the post-positivism approach, positivism, rationalism, and empiricism cannot be separated from qualitative and quantitative data. Quantitative approach is an approach that in research proposals, processes, hypotheses, goes to the field, analyzes data, and concludes data up to the writing using aspects of measurement, calculation, formula, and certainty of numerical data. On the other hand, a qualitative approach is an approach that in research proposals, processes, hypotheses, field observations, data analysis, and data conclusions until the writing uses more aspects of tendencies, non-numeric calculations, situational descriptive, depth interviews, content analysis, and snow ball (Ginting & Situmorang, 2008).

According to Muhadjir (1989), one of the qualitative paradigms was initiated by the philosophy of rationalism which wanted a holistic, systemic discussion, and could reveal the meaning behind sensual empirical facts. Qualitative research is also referred to as a natural paradigm, because in practice, there is a disclosure of reality without making standard and definite measurements where researchers try to describe social phenomena holistically without manipulative treatment. Quantitative research (scientific paradigm) is more emphasized on internal and external validity, instrument reliability and quantitative objectivity (Ginting & Situmorang, 2008).

From the discussion of quantitative and qualitative methods, it can be seen that the qualitative approach is based on a rational approach through the phenomena that occur, but on the contrary the quantitative approach comes from theory which is then developed to find a novelty from research or deductive sources. Based on theoretical sources, qualitative research emphasizes authenticity, not deductively departing from theory but departing from facts as they are. A series of facts that are collected, grouped, interpreted, and presented can produce a theory. Therefore, qualitative research does not start from theory, but inductive research which not only seeks to solve problems but also aims to prove the truth of a theory.

In addition to the approaches mentioned above, it is necessary to analyze the position of case studies regarding the study of the impact of climate change on the resilience of informal areas which are analyzed from the ontology, epistemology, and axiology approaches. An understanding of the aforementioned approaches is needed to build basic

knowledge in research, especially in the environmental field. According to Ginting and Situmorang (2008), there are several stages of approach that must be taken in shaping research into a science. First, from an ontological perspective, which is about what and to what extent you want to produce a theory called grounded theory (theory from the base). On the other hand, quantitative research is often based on theory, so it is reductionist and verification, that is, it only accepts or rejects theory (Ginting & Situmorang, 2008).

In a research case study on the study of the impact of climate change on the resilience of informal areas, the research is carried out through a deductive approach derived from the synthesis of theories obtained from journals and scientific articles, and will then be synthesized to find research gaps which will then refer to the novelty of research or other issues. Kuhn (1974) described the deductive approach and the comparison of end products with experiment remain prerequisites of science. This research uses a mixed method approach because it intends to improve the validity of the research from both rationalism and empiricism perspectives.

Based on the previous analysis which stated that this research used the community as a variable, so that a qualitative approach was also needed to complement the results of the quantitative analysis or deduction method. The study of the impact of climate change on the resilience of informal areas from the beginning has had social phenomena concerning existence in the dimensions of space and time, reached by sensory experience, includes phenomena that can be observed, can be measured, so that the data can be processed, interpreted, verified, and drawn conclusions. In other words, this research does not include elements of the occult such as the position of heaven and hell which is basically a study of religious science.

In terms of epistemology, in addition to procedural aspects, the research includes normative aspects to achieve the validity of scientific knowledge achievements. The methods and techniques of obtaining empirical data that are carried out can be categorized as scientific methods, which include the main steps and their sequences, including the logical thinking processes in them and the scientific thinking tools used. From an axiological point of view, this research tends to relate to the moral principles of developing the use of the acquired knowledge.

Based on the stages of understanding theory related to the ontology, epistemology, and axiology approaches as well as the criteria associated with a case study of the impact of climate change on the resilience of informal areas, it can be analyzed that from an ontological point of view, the phenomenon of climate change, and the resilience of an informal area can be directly observed for its physical form. because it has a tangible variable, namely symptoms can be seen directly. All of these variables can be seen and measured because they are scientific and can be analyzed quantitatively, especially related to climatological, land, and population data. Case studies on the impact of climate change and the resilience of informal areas are also research that has previously been studied by several researchers, which is also accompanied by various evidences and theories that have been developed. On the other hand, data related to human understanding and behavior can be mapped into a diagram or graph. The data can be processed by various analytical and modeling techniques and then verified directly in the field so that scientific conclusions will be obtained justifying the data.

In terms of epistemology, research case studies on the study of the impact of climate change on the resilience of informal areas that occur in coastal cities, it can be analyzed that this research can be classified as scientific research that uses a deductive approach from theoretical research studies that have been proven. This case study is empirical because in the analysis there is processing of graphic and numerical data, and concludes the reading of secondary data. This case study also uses a theoretical synthesis that is arranged logically, because it includes the process of achieving research novelty that has never been studied before.

In terms of axiology, the unifying concept of axiology provides for the study of a variety of questions that have often been considered in relative isolation (e.g aesthetics, ethics, economics and mathematics) (Rämö, 2004). The case studies of research on the impact of climate change on the resilience of informal areas are sufficient to contribute ethic and moral values, so this research can be used as a reference for other researchers to develop science, especially in the environmental field. In addition, the results of this research are expected to be a reference, insight, and ideas for academics, practitioners and policy makers to carry out scientific development.

D. CONCLUSION

From all the stages that have been carried out, several conclusions are obtained from this research. The first conclusion, the position of research case studies with the theme of studying the impact of climate change on the resilience of informal areas related to the point of view of the philosophy of science can be categorized as mixed method research, where this case study can be classified in positivism and post-positivism approaches because basically this research uses qualitative and quantitative methods. The data used is obtained from the synthesis of a collection of journals containing various theories that have been discussed previously to obtain research novelty or theoretical gaps. In addition, research related to the theme of the study of the impact of climate change on the resilience of informal areas is also empirical research because it is carried out through knowledge derived from science and theory that can be accepted logically, as well as the data processing stage which is carried out with a fairly measurable approach.

The second conclusion is that a research case study on the impact of climate change on the resilience of informal areas based on a scientific perspective in the environmental field has many benefits. So that what has been analyzed regarding the position of the case study can be related to the approaches of positivism, post-positivism, rationalism, empiricism, ontology, epistemology, and axiology. Therefore, this research can provide insight for researchers and practitioners, so that it is more appropriately categorized as research in the field of science rather than social science. This field of research is very scientific because it includes a long process, starting with the elaboration of theory, data collection, data analysis, to drawing conclusions using valid methods. So, from those conclusions, it was found that research related to climate change impacts on the resilience of informal areas is an empirical, logical, and measurable research as well as part of a deductive research and reflects that the theme of this research is a part of science.

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