Urban Heat Island Spatial Media Learning in Atmospheric Dynamics and Its Effect on Life Content in Subjects Geography in High School

Siti Azizah Susilawati[1], Muhammad Amin Sunarhadi[2],
SitiBadriyah Rushayati[3], Rahmat Hermawan[4]
Geography Education, Muhammadiyah University of Surakarta[1]
Geography Education, Muhammadiyah University of Surakarta[2]
Bogor Agricultural University[3]
Bogor Agricultural University[4]

Abstract

Spatial learning is a competency that presenting subject materials in a spatial way where it becomes the parameter in recognizing and understanding the interrelation, interconnection and interdependence between material objects of Geography. UHI is a phenomenon of geography and also the result of the dynamics atmosphere which is increasing mainly occurred in urban areas. UHI right conveyed to students through spatial learning based on the curriculum in 2013. Students can study such phenomena through a scientific approach. UHI spatial media learning consist 5 stages as a scientific approach namely : observe, ask, try, associate, communicate.

INTRODUCTION

Education is one of the strategic sectors in supporting the vision of the state of Indonesia as 8 major world power in the year 2045. Education has a great responsibility to prepare young people who will play an active role in Indonesia's establishment, A country with thousands of island and there are many phenomena of natural disasters. Through subjects in school, future generations gain insight, knowledge, and life skills for the future.

Geography is a compulsory subject for specialization in Social Sciences at the high school subjects that are also important for geography education participants who has emphasis on knowledge of the richness and diversity of nature and humans in Indonesia. Geography evoke the spirit of nationalism, patriotism, and how the emergence of innovation activity of society in social, political, and economic space region of the Republic of Indonesia.

Social science with geography spatial platform requires teacher's ability to be able to present an integrated study of human relationships with the environment (integrative social studies) not only as an educational

disciplines. A competency that presenting subject materials in a spatial way known as spatial learning competencies, where it becomes the parameter in recognizing and understanding the interrelation, interconnection and interdependence between material objects of Geography.

An asphalt heat repository phenomenon and make the temperature higher until the evening in a city than the outside area that surrounding town is called UHI or Urban Heat Island (R William Cotton, 2007). This phenomenon is caused by industrialization, transportation and building materials that contribute to warming for examples paving; asphalt; and cement. Moreover, the icreasing numbers of fossil-fuel vehicle and air conditioner not to mention, the reduction of vegetation in a growing city also take a role. The phenomenon that occurs at this time, especially in urban areas must consciously understood by the community. Events that occur have an impact on their lives so that knowledge and action in the form of mitigation should be done. Students are part of society's most vulnerable regarding changes in their environment. Students also an agent that can disseminate knowledge UHI threat to families and communities. Students are one component of the educated in society part of the generation assets of the nation to be involved in disaster mitigation one of them is the Urban Heat Island mitigation. Therefore, knowledge of Urban Heat Island becomes important to be given to the education process.

Discussion on Urban Heat Island can be delivered in class X high school geography's subject; The Dynamics of The Atmosphere and Its Effect on Human's Life. An education about UHI which is one of the global warming phenomenon is very important in the school community. Descriptive studies Carried out at high school students had some scientific knowledge about the greenhouse effect but they had a lot of wrong information and conceptual misconceptions (Boyes&Stanisstreet, 2001). Teachers as a source of informations also has the same problem. The research trainee teachers who conduct the respondent as roomates had some conceptual misconceptions they brought from their high schools and they still Carried on (Boyes, Chambers

and Stanisstreet, 1995). The teachers and the preservice teachers in the USA had a lot of misconceptions about global warming, greenhouse effect, ozone and acid rain. The reason for these misconceptions resulted from the teachers' having superficial knowledge about Reviews These subjects and not completing Reviews their lack of knowledge both from a visual and print media (Khalid, 2001 & 2003). The two different studies conducted in Greece Introduced that not only the teachers but Also the preservice teachers had inadequate information about climate change, the greenhouse effect, acid rain and the thinning of the ozone layer (Michail, Stamou, &Stamou, 2007; Papadimitriou, 2004), UHI impacts and threats that can be felt by the students would be more appropriate students delivered with spatial learning approach.

METHODOLOGY

Urban Heat Island's media spatial learning in the material dynamics of the atmosphere and its effect on human lives of the subjects geography performed with analysis approach descriptive based on competence spatial learning is managing spatial data from maps and remote sensing imagery (remote sensing imagery) are presented according to the standard. Standard presentation that must be mastered in spatial geography teacher competence is in accordance with the Indonesian National Standard (SNI), which is the series 6502.X -2010. SNI on Standard Specifications Presentation Map RBI (RBI) is comprised 6502.2-2010 on skala1: 25.000, SNI 6502.3-2010 on a scale of 1: 50,000 and 1: 250,000 scale refer to SNI 6502.4-2010. This standard establishes the technical specifications, procedures, presentation, and map reproduction.

DISCUSSION

Threat Identification of Urban Heat Island (UHI)

Threats UHI has occurred in major cities in Indonesia, Iswanto, PA (2008) in research in Pangkal Pinang has identified UHI in the city where in 2006 the area UHI expanded with random patterns in the west and east, while Wicahyani (2013) states that the existence of an open non-residential land (vacant lots, fields, and tegal) make the temper-

ature distribution more evenly in the range of 30-40 ° C. On location with the dominance of developed and undeveloped land, the temperature ranges between 35-40 ° C. Susilawati (2016) states that the city of Surakarta increased surface temperatures in 2003- 2011 from 33,1˚ C - 35˚ C increased to 36˚ C - 37˚ C, where the surface temperature is one of the parameters UHI threat in city. The results of identification UHI in Surakarta approach used Normalize Difference Vegetation Index (NDVI) and Land Surface Temperature (LST) conducted Susilawati (2016) later in this paper are used as examples of medium spatial learning in the material dynamics of the atmosphere and its effect on the lives of the subjects of geography in senior high school.

The results of the analysis of 2003 Landsat 7 ETM + showed that the NDVI Surakarta dominated index (-0.4)–(-0.1) or in the form of settlements where there is almost no vegetation on the region, the extent of the index reached 56.7%, while the vegetated area with level medium.

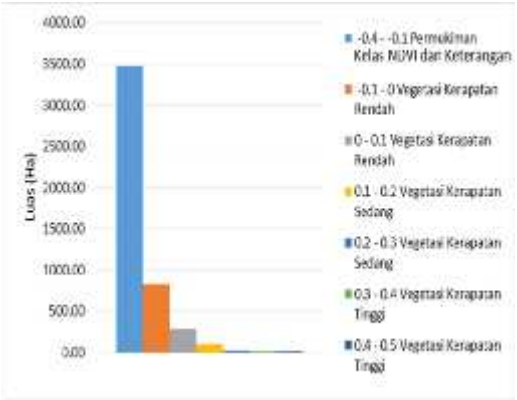

Figure 1. 2003 Surakarta's NDVI.

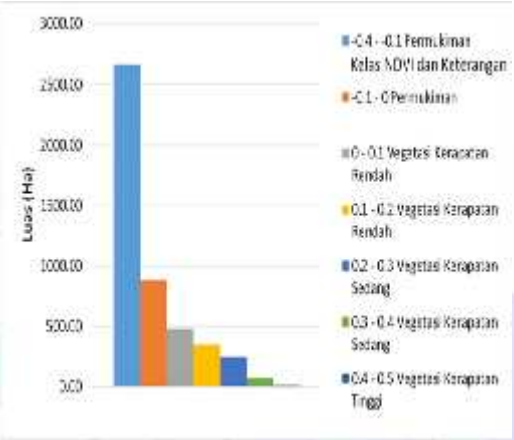

Figure 2. 2011 Surakarta's NDVI.

Based on Landsat In 2011 there was an increase in NDVI and undeveloped land, where residential areas reached 73.7%, while the high vegetation density does not reach 1%. Increased vegetation density index on the class of -0.4 - -0.1 from 2003 to 2011 in Surakarta is an early indication that in Surakarta rise in temperature in the micro. Based on Landsat imagery can also discovered that the average surface temperature (LST) Surakarta increased surface tempera-

tures 33,1˚ C - 35˚ C and increase to 36˚ C - 37˚ C in 2011.

Figure 3. 2011 Surakarta's Land Cover Map

.

Figure 4. 2011 Surakarta's NDVI Map

Urban Heat Island (UHI) A Spatial Educational in Class X High School

Based on the 2013 curriculum formulated to achieve the basic competencies of core competencies. Where the formulation of basic competence is developed by taking into account the characteristics of students, early ability, as well as the characteristics of these subjects. Urban Heat Island (UHI) spatial learning High School Class X is one of the phenomena of geography are included in the basic competencies 3.1.dalam core competencies 3. UHI phenomenon of atmospheric dynamics that directly affect the daily lives of students. Gritzner (2003) said that "every day of our lives, we live geography", more specially Fernald (2002) states that geography is the analysis of the areal distribution of a phenomenon the location and distribution of phenomena in space, or place, by the means of identifying Reviews their density, pattern, diffusion, and dispersion "and finally he said that geography is" the unique "discipline that examines the earth from soatial point of view. Based statements that, ones of UHI phenomenon can roomates analysis by stundents at atmosphere dynamics.

Table 1. Geography Syllabus of Senior High School Class X.

	Main Competency		**Basic competency**
3	Understand, implement, analyze and evaluate	3.1	Understanding the basic knowledge of geography with

	knowledge factual, conceptual, procedural, in science, technology, art, culture, and humanities with the insight of humanity, national, state, and civilization-related phenomena and events, as well as applying procedural knowledge in specific areas of study that suit their talents and interests to solve problems	examples of everyday life 3.2 Understanding the dynamics of the solar system and its influence on life 3.3 Understanding the dynamics of planet Earth as a living space 3.4 Analysing the dynamics of the lithosphere and its influence on life 3.5 To analyze the dynamics of the atmosphere and its effect on life 3.6 Analysing the dynamics of the hydrosphere and its influence on life 3.7 Evaluate appropriate action in the mitigation of natural disasters

Students in High School can perform spatial learning UHI Surakarta by scientific approach as:

- Viewing

  Viewing can be done among others through activities seeking information, see, hear, read, or listen to. Based on land cover maps, NDVI and LST to identify UHI.

- Ask

  Ask students to build knowledge in a factual, conceptual and procedural, to think metacognitive, can be done through discussions, group work, and class discussions. Based on land cover maps students to question the relationship between land cover, NDVI and LST against threats UHI

- Attempt

  Exploring / gathering information, or try to increase the curiosity of students in developing creativity, can be done through reading, observing activities, events or certain objects, obtain information, process data, and present the results in writing, orally, or pictures. Students overlaying maps of land cover, NDVI and LST to determine its range.

- Associate

  Associate can be done through analyzing the data, classify, categorize, conclude, and predict / estimate. Students overlaying maps of land cover, NDVI and LST to determine its range and the relationship between these parameters to the threat of UHI

- Communicate

  Communicating is a means to deliver results in the form of verbal conceptualization, writing, drawing / sketch, diagram, or chart, can be done through presentations, reports, and / or performance. Students present the results of the four above activities and a presentation about the threat of UHI based spatial learning.

The learning activities described above in the groove following activities:

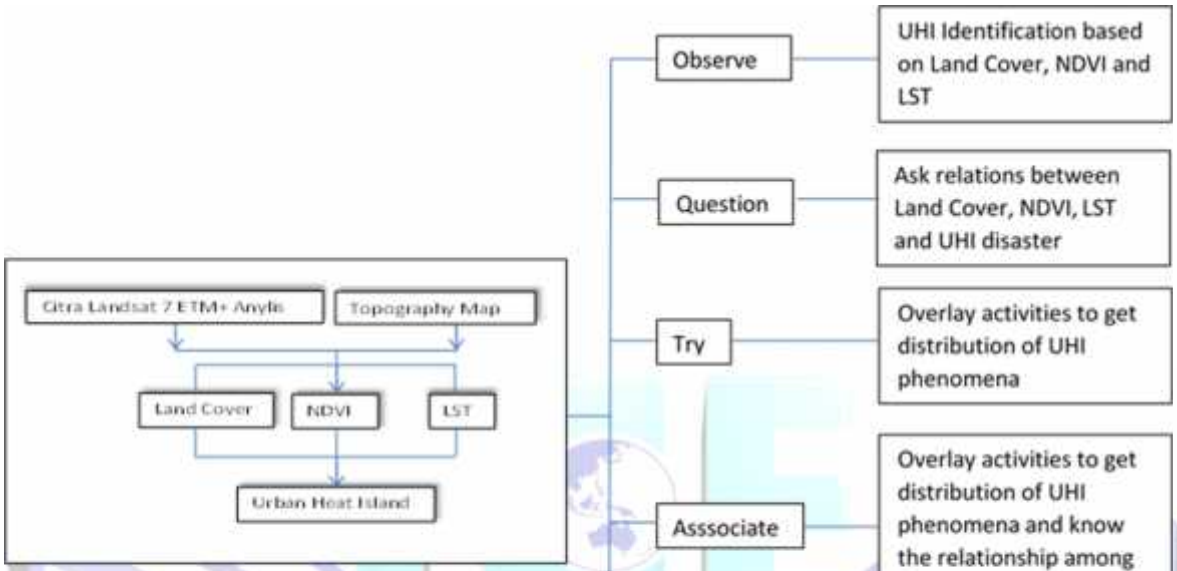

Figure 5.UHI Spatial Learning Flow Chart

CONCLUSION

UHI is a phenomenon of geography and also the result of the dynamics of the atmosphere in which this phenomenon is increasing mainly occurred in urban areas. UHI right conveyed to students through spatial learning through the curriculum in 2013, where students can study such phenomena through a scientific approach.

ACKNOWLEDGEMENT

Environment Analysis and Spasial Model Laboratory of IPB, as digital image processing. Baharudin Syaiful Anwar, Miftahul Arozaq and Zaid Ali Wardana as a image processing tutors.

REFERENCES

Boyes, E., &Stanisstreet, M. (2001). School students' ideas about the "Greenhouse Effect" a decade on. Canadian Journal of Environmental Education, 6, 77-101.

Cotton R William. (2007). Human Impacts on Wheather and Climate, Cambridge University Press, UK.

Boyes, E., Chambers W., &Stanisstreet, M. (1995). Trainee primary teachers' ideas about the ozone layer. Environmental Education Research, 1 (2), 133-145.

Khalid, T. (2001). Pre-Service teachers' misconceptions regarding three environmental issues. Canadian Journal of Environmental Education, 6, 102-120.

Khalid T. (2003). Pre-Service high school teachers' perceptions of three environmental phenomena. Environmental Education Research, 9 (1), 35-50.

Michail, S., Stamou, A. G., &Stamou, G. P. (2007). Greek primary school teachers' Understanding of current environmental issues:An exploration of their environmental knowledge and images of nature. Science Education, 91, 244-259.

Papadimitriou V. (2004). Prospective primary teachers' understanding of climate change,

Greenhouse effect and ozone layer depletion. Journal of Science Education and Technology, 13 (2), 299-307.

SuksesiWicahyani (2013) Prosiding Seminar NasionalPengelolaanSumberdayaAlamdanLingkungan 2013, pulaubahangkota (urban heat island) di Yogyakarta hasilinterpretasicitralandsat tm tanggal 28 mei 2012.