การพัฒนาของภูมิศาสตร์ในโลกปัจจุบัน
The Development of Geography in the Contemporary World

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หลายทศวรรษที่ผ่านมา เมื่อพูดถึงศาสตร์ที่เรียกว่า ภูมิศาสตร์ หลายคนอาจไม่เข้าใจว่าศึกษาเกี่ยวกับอะไร นักภูมิศาสตร์ทำอะไร ในความคิดของคนทั่วไปอาจมองว่าภูมิศาสตร์เป็นเพียงการศึกษาเกี่ยวกับที่ตั้งของประเทศต่างๆ บนแผนที่ หรือเป็นเรื่องของการจำชื่อสถานที่ ชื่อเมือง หรือชื่อประเทศต่างๆ บนโลก จนกระทั่งต่อมาในช่วงทศวรรษ 1950 นักภูมิศาสตร์ได้พยายามพัฒนาศาสตร์ของตัวเองให้เป็นที่รู้จักและยอมรับมากขึ้น โดยพยายามปรับปรุงหลักการพื้นฐานของสาขาวิชาและปรัชญา ด้วยการนำวิธีการทางวิทยาศาสตร์และการคำนวณทางคณิตศาสตร์เข้ามาใช้ในงานด้านภูมิศาสตร์มากขึ้น ประกอบกับเทคโนโลยีภูมิสารสนเทศที่เข้ามามีบทบาทต่อการหาตัวอย่างการวิจัย การเก็บรวบรวมข้อมูล การวิเคราะห์ และการแสดงผลชุดข้อมูลเชิงพื้นที่อย่างมีประสิทธิภาพ ปัจจุบันภูมิศาสตร์ได้พลิกโฉมหน้าใหม่ต่อสังคมเป็นศาสตร์ที่แเป็นพลวัตและใช้วิธีการศึกษาเชิงสหวิทยาการเพื่อการขยายองค์ความรู้ สามารถตอบสนองต่อคนในสังคมมากขึ้นและเป็นที่รู้จัก ภูมิศาสตร์จึงไม่ใช่แค่การตอบโจทย์ของการเข้าใจพื้นที่บนโลกและกิจกรรมของมนุษย์แต่ยังช่วยพัฒนาคุณภาพชีวิตของมนุษย์ได้ดียิ่งขึ้นยิ่งไปกว่านั้น ภูมิศาสตร์ยังสามารถช่วยจัดการ และแก้ไขปัญหาต่างๆ ได้อย่างมีประสิทธิภาพสะดวกรวดเร็ว ด้วยเทคโนโลยีทางภูมิศาสตร์อันทันสมัยและประยุกต์ใช้ได้อย่างกว้างขวาง

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บทความนี้มีวัตถุประสงค์เพื่อนำเสนอพัฒนาการของแนวคิดและหลักการพื้นฐานทางภูมิศาสตร์จากอดีตถึงปัจจุบัน รวมถึงชี้ให้เห็นถึงสิ่งที่นักภูมิศาสตร์กำลังกระทำและแนวทางของภูมิศาสตร์ในโลกปัจจุบัน

คำสำคัญ: ภูมิศาสตร์ สหวิทยาการ ภูมิสารสนเทศ ระบบสารสนเทศภูมิศาสตร์ มุมมองเชิงพื้นที่

Abstract

Over the past decades, when the term “Geography” was introduced in a conversation, people seem to be completely blank. Most people did not realize what geographers had done. In their opinion, this science might simply involve locations of countries on a map or place-name memorization. Not until 1950s, finding a solution to this problem was one of the greatest challenges faced by geographers. As a result, attempts were made to improve the fundamentals of geography and subsequently combined scientific methods and modern high technology of geoinformatics for sampling, collecting, analyzing and visualizing geospatial data sets. At present, geography has becomes a dynamic science and requires interdisciplinary approach which has integrated other disciplines into its contexts to extend knowledge as a whole. It has therefore turned around to the society’s aspects which support not only the understanding of the earth and human activities but also the improvement of the quality of human life. Furthermore, it can manage and solve problems quicker, easier and more efficient using powerful geographic technologies compared with the conventional approach. This article aimed to present the historical development of geography’s thoughts and to highlight what geographers have recently done as well as the ways of geography in this world.

Keywords: Geography, Interdiscipline, Geoinformatics, GIS, Spatial perspective

Introduction

People generally think of geography as a discipline that would have been shoved under the carpet and usually taught by rote memorization (Rosenburg. 2006). That is why geography has been neglected for a long time. Actually, the common definition of geography is a spatial science emphasizing natural or human-related phenomena on the Earth. Regarding the foreword from the Past-President and the Director of the Royal Geographical Society on Unifying geography Common Heritage, Shared Future by Matthews and Herbert (2004), "geography has always been a diverse discipline... It can only be a strength, however, if it develops around a common core of knowledge..." That common core is related to spatial perspective on both human and physical geography. This perspective benefits the wide studies of changing spatial patterns in natural and cultural environments, identifying causes of change and how this affected human society, and exploring the ways of solving to improve the quality of life. Unfortunately, only few people know about the disciplines' context while others have not realized its usefulness.

Nowadays, geography becomes a science of integration embracing a social science, a natural science, an environmental science and even humanity on its discipline (Bailly and Gibson. 2004, Sala. 2009 and Koutsopoulos. 2011). Furthermore, its advanced technology provides various functions to facilitate geographic researchers to work with other groups of research disciplines such as medical science, economics, and politics. This extends the research knowledge wider than the past in the respect of analyzing tremendous problems of human society. This article aims to present historical development of geography and trend of geographic works by providing some remarkable examples of what geographers are working on as well as the ways of geography at present.

The historical background and development of Geography

Although geography had emerged since the Greek and Roman periods, it was known as an academic discipline which was formally studied in school and university just a century ago (Johnston. 2015). In Thailand geography has firstly been taught at the Faculty of Arts, Chulalongkorn University since 1935. At that time, it was however tied with History called Geography and History Department (ไพฑูรย์ พงศะบุตร. 2529). Since the first half of 20th century, geography has acted as an empirical science. It explains phenomena on the earth by observation, experience and empirical evidence and describes the system of general ideas concerning place, space, direction, location, scale, and environment. At that time, philosophy of geography emphasized human and environment interactions (ฉัตรชัย พงศ์ประยูร. 2549) especially environmental determinism which explained the influence of environment on human beings. In addition, the Charles Darwin's Theory of Evolution was integrated to explain spatial changes on Earth by modern geographers. For instance, William Morris Davis, a geographer at Harvard University, founder of modern geography in the United States of America, believed in environmental determinism. He applied the Charles Darwin's theory to describe physical surface of the Earth. This brought about the clear understanding of the Earth by presenting the Davisian cycle which explained the erosion cycle of landforms comparing to mean sea level. He stated that this process was similar to human life cycle which changed from youth to old age. Furthermore, Friedrich Ratzel, a German geographer, who was one of the founding figures of modern academic geography created the outstanding works such as Anthropogeographie explaining the basis for environmental determinism and outlining of political geography's key concepts (Netter. 2005). He introduced the idea of "organic state theory", explaining that each state was very much like an organism with life cycles, i.e. at a young age, it needed lebensraum, or living space, in order to grow up (Russell. 2006). By the early 1950s, geography had dominated in regionalogy (regional geography) which explained differentiation of areas or regions. Both human and physical

geographers tried to identify, describe, and investigate the reason of areal differentiation of the earth's surface. However, the interest of regional study had fallen since 1960 when modern geography emerged.

Although the evolution of geographic approaches had changed from time to time, it was treated as a purely descriptive discipline which could not be proved logically and was difficult to conduct scientific experiments. There were usually subjective and humanistic researches which explained about varying spatial characteristics as a result of human occupancy and behavior. There was nothing new in this field until late 1950s, which was the greatest revolution of geography (ฉัตรชัย พงศ์ประยูร, 2539) called theoretical and quantitative revolution. Many experts who were keen on this discipline tried to find the truth and explain the process of the earth's phenomena occurred by both human and natural forces using scientific methods and spatial theories known as positivism approach. They had continuously delivered not only research projects but also the fundamentals of geographic concepts. Scientific methods, statistics, computer science and mathematical models had strongly influenced this revolutionary period. Spatial statistics had been developed to express the way of thinking and describing about the relationships among spatial objects.

On the other side, many geographers argued that the basic principle of discipline adhered to scientific procedures may not able to produce detailed information about unique places which were close enough to reality. Some theories behind spatial analysis were unrealistic to be applied to human activities because of many constraints on theories and experiments. Therefore, an alternative group of geographers who did not believe in positivism introduced other geographic thoughts in a specific way. For instance, behavioral geography was formulated with the context of general theories of how people make decisions in and about space such as the gravity model applied to migration patterns and the diffusion of diseases. This field emphasized understanding of human behavioral patterns and analyzing data about the

individual's behavior. In addition, the behavioral geographers improved their theories by incorporating more realistic assumptions (mainly considering of subjective distance and time of the individuals) about spatial behavior in space, places, and the environment (Montello. 2013 and Golledge and Stimson, 1997). Whereas, another line of geographic study followed the concept of Marxism which inspired geographers to consider spatially-unequal power interactions in everyday experience as people made their own histories and geographies but not in circumstances of their own choosing (Clayton. 2013). As a result of globalization and freedom of academic ideas, geography has spread out in diverse fields of study particularly human geography. Human geography has been divided into various subfields with different context, paradigm and approach such as humanism and structuralism (ฉัตรชัย พงศ์ประยูร, 2539).

Since 1980 the discipline has notably developed into automated geography with modern technologies in computer science and geographic information system (GIS). GIS plays an essential role in this science being capable of integrating various sciences, designing database of spatial and attribute data and managing and analyzing all input data by advanced GIS software on GIS platform. The growth of sophisticated GIS along with geospatial analysis has contributed tremendously to social sciences, humanities, and natural sciences and to the GIS-related profession (Richardson. 2006).

Remote sensing (RS) technology was developed to provide advanced monitoring, modeling and mapping of land covers. Generally RS receives digital images from passive optical system which is limited in its ability to collect data during off-light from the sun. However, the RS technology has launched an alternative advanced sensor to utilize laser altimetry or Lidar (light detection and ranging) which is able to measure three-dimensional pattern of Earth's surface without limitation of the sunlight and fog. Lidar remote sensing has applied to various fields of geospatial science and ecological research in particular. It provides an accurate tool for measuring topography, vegetation height and

canopy structure of forest. This can identify the risk of wildfire in forest area by calculating the total volume of woody fuel within a forest canopy associated with the creation of fire (Lefsky et al. 2002). Another important technology of geography is global positioning system (GPS) which is a satellite based navigational system. GPS is used for multi-functions of place description; determining location, travelling navigation and tracking, measurement of speed, time and elevation of place as well as mapping.

Collectively, these beneficial geographic technologies have been developed into “Geoinformatics”, the context of which comprises the GIS, RS and GPS. These techniques have positively motivated our society. Geoinformatics technology provides solutions to human problems. In addition, cooperating with experts from various fields and using geographic tools can help solving spatial problems and achieving their efficient outcomes.

During the past two decades, the miniaturization of computer technology combined with the ability to carry out continuous monitoring of RS. The use of GPS increased the interests of research and geography education focusing on geospatial analysis. Also, the GIS has developed powerful functions to collect, manipulate, analyze, and visualize spatial and non-spatial data in order to produce satisfied demanding researches and ways of solution for crucial problems in human society. Several upcoming researches are capable of verifying and graphically displaying spatial patterns of social units on maps and digital scenes with two and three-dimensional visualization. This led to an increased number of geography works. For example, at the prestigious Harvard University established a new Center for Geographic Analysis (CGA) in 2006. This center provides full facilities for people who were interested in spatial research projects as well as sufficient professors and experts in geography and technicians to giving a suggestion, support research projects and courses concerning spatial analysis. Furthermore, it has shown a significant sign that the CGA represents the return of this Geography which Harvard University has neglected for a long time (Rosenberg. 2006).

What have geographers done recently?

Geography has been designated as one of the most valuable subjects that assisted humans to gain better understanding of the space where they live. In the following section, examples will be shown to demonstrate what geographers have studied and analyzed in spatial context of place, space, and environment. These emphasize the contribution of geography in supporting our sustainable society.

Firstly, geography provides an application to find suitable locations for human activities particularly economic and business ones. People usually seek suitable sites for specific activities such as industry, retailing area, power plant, housing, solid waste disposal and agriculture. The process of geographic analysis is capable of giving the best sites and locations by integrating all relevant factors that constitute the particular entities. For example, GIS based multi-criterial has been applied to determine the optimum sites of nuclear power plants for supporting the growths of electricity demands at Pahang state in Malaysia (Idris. 2012). Lately, Khan and Rathi (2014) located the optimal site for large scale solar power plants carried out at the Rajasthan of India. Their geographic factors are included distance from highways, availability of solar radiation and vacant land and sites' topography.

Secondly, GIS-based spatial analyst module and network analyst module can be used effectively in business management and logistics management system to find the best routes for goods distribution, to track transportation in real time and to design models of decision support system for retailing, warehouses and manufacturing centers. Furthermore, the GIS network analyst extension has been designed to analyze more reliable results. The method of network analysis is based on the topological structure of line features to analyze travel costs along paths and compare the time and costs optimization.

For instance, Beuthe et al. (2001) applied the GIS based model of multimodal network for freight transportation in Belgium. Their work estimated direct and cross-elasticities of different modes of transport using point-to-point of origin-destination cost matrix per group of commodities and modes of transport (heavy and light trucks, type of boats, etc.). As a result, an optimal route was proposed as the minimum cost route over the transport network.

Besides, network analyst module was added as an extension in ArcGIS (one of GIS software) platform that provides various solutions of network-based spatial analysis. Those are functions of best route, vehicle routing problem (VRP), closest facility, service area, origin-destination (OD) cost matrix and location-allocation analysis. For example, the best route functions have been used to find efficiently the best travelling routes for the trucks during solid waste collection. In order to identify the route optimization, distance and time criteria by the trucks' collection (regardless of time spent in traffic) were considered and generated. By considering speed formula (V = D/T, V stands for average speed or velocity, T stands for traveling time, and D stands for traveled distance), duration taken for each truck travelled for solid waste collection was obtained. After inputting the stop locations of waste collection, the optimized routes for solid waste collection were determined. These stops were ordered automatically for trucks to collect the waste. Another recent example was an application of competitive location model and market share analysis on GIS platform to develop decision support system about locations of retail shops' franchise distribution (Suarez-Vega et.al. 2012). In addition, the maximize market share analysis, one of key calculations in location-allocation analysis, was embedded in the Network Analyst module of ArcGIS 10x software to perform wider solutions. This function aims to find the location that will maximize the market share in the specific number of retail sites. It is used for solving the competitive location problem on networks to establish new potential stores or facilities (Panbamrungkij. 2012).

Moreover, the advance of new technology that combines GIS with GPS as a navigator system has made geographic tools more practical to use in most households. The navigator system has been installed in vehicles to navigate and track where they are going with high accuracy of destination time estimation and virtual images along the route. This technique can be installed in computer, tablets and mobile phones. Users are able to plan or estimate the total distance and time for their journey and also travel to their destinations faster with the provided guidelines.

Thirdly, GIS is capable of predicting and monitoring events especially natural hazards. For instance, the 2004 tsunami devastation in South Thailand was graphically simulated in two-three-dimensional scenes of flooded area caused by tsunami waves. Tripathi and Soomro (2007) certainly succeeded in employing GIS approach to identify tsunami disaster risk zonation in Krabi province, Thailand. In order to prevent the colossal loss of human lives and destruction of coastline, geographic techniques were introduced to develop tsunami hazard maps, tsunami vulnerability maps, and tsunami risk zone maps for tsunami hazard mitigation. These maps aim to save human lives and build-up areas in the future if tsunami might occur again.

In some cases, GIS and satellite images can be used to perform long-term monitoring of the polar ice shelf. Researchers have collected the changing images and calculated volume of ice loss and then visualized the causes of the break. In addition, U.S. Coral Reef Task Force (CRTF) and the U.S. Geological Survey (USGS) have been working closely to create maps and monitor U.S. coral reefs in order to gain better understanding of the processes that affected the health and sustainability of coral reefs. GIS facilitate to create baseline digital maps. However proper databases must be provided to detect and understand changes in the reefs.

Fourthly, the use of three-dimensional visualization has become up-to-date trends of research in geography in this decade. Many researches have dramatically carried out the module of 3-dimensional (3D) analyses and presentation on GIS platform. For example, the 3D-GIS was performed for predicting the impact of traffic noise on building and ground surface. Pamanikabud and Tansatcha (2009) applied 3D on GIS platform to support the visual understanding of the intensive levels of motorway noise impact which varied depending on different direction and height of the building.

Fifthly, geography can be applied to urban planning and sustainable development. No matter how large or small the communities are, they must deal with the impact of modernity, resulting in physical, social and cultural changes of urban life. Planners must consider public policy, geographic perspectives and geoinformatics technology in order to create models and planning support system. Currently, there are many projects utilizing geographic techniques to investigate and solve complex problems related to urban growth, sprawl, traffic congestion, vacant properties, public transit, urban decay, accommodation and open space. The advantages of spatial analysis in GIS and RS are that users can reach their goals of sustainable planning by capturing, tracking and analyzing spatial influence factors such as parcels zoning of land use, timeframe and infrastructure network. For instance, Wu et al. (2015) investigated spatiotemporal pattern of urban expansions in three cities; Beijing, Tianjin and Shijiazhuang during past three decades (from 1980-2010) using multi-temporal Landsat satellite data integrated with GIS spatial analysis and landscape analysis approach. The results showed different expansion patterns of each city (mononuclear concentric, double-nucleated polygon-line and sectorial point patterns) primarily depending on topographic constraints and urban planning and policy. Result of these expansions therefore affected urban economics, activities and landscape.

Finally, environmental issues have increasingly been concerned by modern geography. Recent geographic works have supported the use of clean energy and energy supply planning in accordance with national environmental friendly policies. This brings about the development of environment and energy geographical information system (E-GIS). The E-GIS is applied to construct database and model for assessing the potential site of power plants in urban area. This can evaluate the potential site of wind farm, solar energy supply and even energy supply plants depending on energy demands of each activity in urban area (Watson and Hudson. 2015 and Yeo and Yee. 2014).

The ways of geography in the contemporary world

Basically, modern geography were classified into four categories; foundations of geography, physical geography, human geography, and technical geography (Sala. 2009). In practice, Geography is principally divided into 2 areas: human geography and physical geography. Although both share the common spatial concepts of the discipline, human geography and physical geography concepts seem to be apart in terms of publication, methodology and success. Physical geography has become mainstream science quicker than human geography. However, the human geography has increasingly focused on quantitative methods and has been placed in the social sciences. Geographers who are keen on the human geography tends to be interested in the logic of sense, human perception and how space construct this logic of perception and imagination of new space forms through time. This form is scientific form and the different layouts of situation, context, event, and time period can produce different effects of the things we are watching (Thrift. 2002).

At present, geography has been designated as a broad interdisciplinary field that encompasses a number of different subfields (Clifford. 2002 and Thrift.

2002). Geographic tasks prove that evidence that geography is involved with diverse fields in methods and contents and they can build linkages to other fields. Mostly, the aims of the geographic tasks are to understand, to plan, to develop spatial modellings and activities and to predict changes of spatial phenomena over time. Geography basically is not just limited to our old-time thoughts. Modern geographers are therefore developing potential models for analyzing spatial data and applying geographic knowledge to other sciences based on spatial perspectives. Whenever geographers focus on patterns that places and spatial features are laid out or organized on the Earth surface, they have raised questions on how this arrangement has come about, what processes created the particular patterns and how relationships exist between different places and features. The answers can be achieved by interdisciplinary approach. From the author's point of view, geography required spatial-based interdisciplinary approach which establishes integration of multidimensional relationships and interdependencies of all relevant disciplines including geoinformatics (Koutsopoulos. 2011). Geographic research is difficult to run on individual science without engaging other disciplines in both methods and concepts. To make this statement clear, an example of a research project undertaken in Thailand entitled "Suppression of dengue transmission by application of integrated vector control strategies at sero-positive GIS-based foci" is demonstrated. This research was conducted with the collaboration of medical researchers and geographers by using geographic tools to support their epidemiological research or the so called 'Medical Geography', which is a subfield of human geography. One of the main research processes was to plot patient locations on maps and show topographic environment around study areas (Kittayapong et al. 2008). It can help researchers find the causes of transmission and diffusion patterns easily and then precisely take a precaution.

Furthermore, there are several urgent threats to global health and human well-being such as overpopulation, resource shortage, extinction of

plants and animals, climate change and social conflicts. Integration of interdisciplinary subjects is evidently needed to solve these situations. They attempt to design and depict plans for human activities in order to fit and no detrimental effect on consequences of environment in the future.

As a result of advanced technology, GIS is capable of spatial modelling to support solutions of these crucial problems. In addition, the use of geographic information and technology has been developed as "GIScience" knowledge area which is firstly known in the United State along with the University of Consortium for Geographic Information Science (UCGIS) was founded in the mid-1990s. This place formed the formal curricula for educators who want to know and apply the GIScience to various discipline. Then, the term "GIScience" now represents the spatial conceptualization, spatial data acquisition, management, analysis, interoperability among various patterns of computer platforms, and visualizations (Getis. 2004). Clearly, geography is modernized from time to time to serve widely usage for the human living. Even though it is flexible to implement and integrate across other disciplines, the concept of geography still sticks to the spatial perspective to strengthen its unity and its own discipline.

Conclusions

Geography becomes a more powerful discipline after the development of advanced technology within this discipline. It contains a key knowledge base which has been passed from generation to generation. It was once an unclarified science with doubts about what geographers had done until it has become an important discipline nowadays. Geographic methods and technologies are reliable and acceptable to other academic fields. At present, geography mainly considers the social and environmental problems.

A contribution of geography to other disciplines is needed to provide better decision makings and to solve problems in places around the world. Thus, “Geography” is going to be a high-performance science for human on this livable earth.

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