

## **The Development of National Atlas – Malaysia’s Experience**

**Nur Zurairah ABDUL HALIM, Zoher NOMANBHOY, Mohd Noor ISA, Malaysia**

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### **SUMMARY**

A national atlas is an essential multi-subject geographic atlas of a country. It is a widely known cartographic product which contains the summary representation of contemporary scientific knowledge of the country in the field of physical, economic and political geography. The conception of a national atlas is a complex and no trivial matter. Nevertheless, a national atlas is deemed necessary for infrastructural planning, pre-investment studies and as a source for geospatial information transfer that enables international comparability. On top of that, it is a symbol of national unity, scientific achievement, and political independence. Realising its importance, the new National Atlas of Malaysia project was initiated in mid-2014 and later completed then published in late-2016. This paper aims to share the experience of developing the National Atlas of Malaysia. The methodology of designing the national atlas is explained, while issues and recommendations from Malaysia’s perspective are also highlighted. The ongoing progress of updating the national atlas is also deliberated to ensure the relevancy of the national atlas to the public. By publishing the national atlas, the dissemination of popularised but authoritative scientific information about the geography of Malaysia from a national perspective can be achieved.

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## 1. INTRODUCTION

### 1.1 Atlas

Before the 19<sup>th</sup> century, atlases were made as a reference, mainly to show the discoveries and conquest of the Europeans. Today, an atlas is a collection of thematic maps designed to be kept in volume, showing the spatial distribution of phenomenon and contain a substantial of spatial and attribute data that are displayed as maps. Non-map elements like text and graphics are also embedded to amplify information transfer. Nonetheless, it should be noted that an atlas is not just a random collection of maps but the result of a systematic approach, with a specific narrative that provides cohesion to every themed map (Blok & Versloot, 1993). The elements of cartographic including choice of scales, levels of generalisations and labelling are applied in atlases to allow the ‘readers’ to understand the coherence of the spatial characteristics and information of an area or a theme. The advantage of having atlases rather than a map is because atlases allow easy comparisons of themes, space and time over the individual map (Aditya & Kraak, 2006). As a result, maps in atlases are handy in the early inventory stages of planning and decision making, as information sources for politicians, legislators, administrators and planners.

### 1.2 National Atlas

One can distinguish among many different atlases. For example, reference, school, topographic, national, and thematic atlases (Kraak, 2006). This paper emphasizes on the national atlas. National and regional atlases have common origins, but as Nicholson (1970) points out, "true regional atlases are not usually national atlases in miniature". A national atlas shows as entirely as possible spatially relevant data about the nation but in a way that comparison is possible. It contains in summary representation of contemporary scientific knowledge of the country in the field of physical, economic and political geography. Materials from a wide range of sources commonly from institutes, bureaus and governmental organisations that generally are not accessible are made available to the public.

The making of national atlas began with the increasing demand for quality and quantity of spatial science in the 19<sup>th</sup> century. As more countries gained independence in the following century, a national atlas was deemed necessary as an inventory of spatial information of a country, to describe the characteristics of a nation, scientific inventory to initiate new research or investment and cultural ambassador to present the country (Bakker, van Elzakker, & Ormeling, 1987). It is also a substantial source for geospatial information transfer that enables international comparability. On top of that, Monmonier (1994) added, it is a symbol of national

unity, scientific achievement, and political independence. From the perspective of education, a national atlas is useful as a comprehensive single and reliable reference source of spatial information among students. The national atlas may also be useful in stimulating an appreciation of national identity and can be regarded as a kind of cultural ambassador, or for public relations so the knowledge gap pertaining to the nation can be bridged among the public, tourist, investors, researchers or developers. Nonetheless, the aims of every national atlas are arbitrary and highly influenced by nationalistic ideology (Blok & Versloot, 1993).

### 1.3 Components of a National Atlas

Traditionally national atlases are available in books, but with the advent of the internet and GIS, national atlas are also available in digital forms or interactive maps. The first recognised 'modern' national atlas, the Atlas of Finland, was published in 1899. A departure from previously produced atlases, it "presented in a very concise, economical and clear manner a tremendous variety of information on the physical environment, population and economy of the entire country" (Fremlin & Sebert, 1972). Fifty-seven years later, an International Commission on National Atlases was set up by Professor K.A. Salichtchev, who was an Honorary Fellow of the International Cartographic Association, to review and recommend national atlases design and content in order to ease the usability of the national atlas (Ormeling Sr, 1979). The recommendations included:

- i. The content is separated into five structured divisions, physical geography, population, economy, cultural, and political and administrative structure, usually with an introductory section preceding the content specifications.
- ii. Methods of representing phenomena with different types of distribution: at points, along lines, in discrete areas, sparse and continuous across the area.
- iii. Use of a simple, rounded [standardised] scale of 1:1,000,000, by which all other scales can be related (doubling or halving). An ideal format should be 40-50 cm by 60-70 cm when opened.
- iv. A single projection for all maps should be used, with a fundamental aim to restrict distortions; for the world's largest countries, recommendations are made on the appropriate projection to be used.
- v. Graticules should appear but not emphasised on all maps, except in "map diagrams": choropleths, "maps-with-graphs", inset maps or "social topic" maps.

In reference to the above, Kent (1986) also highlighted that there are three components to distinguish a national atlas:

- i. It must be produced with the approval of the national government;
- ii. The goal is to provide a broad and accessible thematic coverage of one nation, and
- iii. Must be produced at a high intellectual and cartographic standard.

In other words, even if the thematic coverage of a nation is broadly covered, but the atlas is privately authored and published, nor a complete thematic coverage of a nation had been prepared by the government's aegis, but the atlas is restricted and inaccessible, then, the both of them would still not be considered a national atlas.

## 2. NATIONAL ATLAS FOR MALAYSIA

Malaysia's first national atlas was published in 1977. It was developed based on the recommendations highlighted by the International Commission on National Atlases. However, like most countries with national atlases, Malaysia also faced the same difficulty as the rest, which is to manage newly updated edition within, i) a specific time intervals; ii) limited financial source and iii) extensive labour. As a result, the proposal to update the national atlas was finally approved by the National Spatial Data Mapping Committee or also known as JPDSN in 1994. Following the consensus, works on developing the National Atlas Information System (NAIS) was initiated and was realised in 1999, with the aim to establish a fundamental database for the creation of an updated national atlas and electronic map publishing. The basis of distinguishing a national atlas as highlighted by Robert (1986) was highly noted in the preparation of the national atlas.

The first electronic Map or eMap was published in 2001, which covered Federal Territory Kuala Lumpur and Putrajaya. Consequently, every state in Malaysia was prepared with eMaps, but with limited themed maps. Subsequently, the advent of web map services during the course of the Web2.0 revolution allowed the introduction of WebMap in 2002. Even though most of the maps in eMaps or WebMaps only covered political and physical map themes, the maps have played a significant role in transferring geospatial and statistical information to users in an interactive multimedia cartographic form. It was agreed that a coherent but a variety of themed maps are desired to produce a national atlas - the inevitable systematic publication of institutionally collected geospatial information to enable a partial or total synthesis to be made.

Therefore, the National Atlas Technical Committee (NATC) that comprises various members from governmental agencies and data custodians was subsequently formed in 2010, under the purview of JPDSN and spearheaded by the Cartographic and GIS Division, Department of Survey and Mapping Malaysia (JUPEM). The members were carefully selected to ensure the authenticity of the information provided in the national atlas. NATC aimed to coordinate and ease data sharing and descriptive information of specific themed maps, aside to monitoring the working progress of publishing a new and replacing the former national atlas according to the specified themes by the relevant working groups.

Five working groups were established based on the five structured divisions recommended by Salichtchev's were adopted as shown in Table 1, to implement the atlas information gathering. However, as the project progresses, additional relevant themes were identified and adjusted to suit with Malaysia's context as shown in Table 2. Working group chairs were appointed to lead each theme. The Working Groups were responsible for grouping, class and range the atlas according to its designated themes based on vector data of 1:500,000 scale, in the form of various GIS formats namely \*.shp, \*.tab or \*.mdb. Apart from that, the working groups were also responsible in preparing descriptive information such as text, figures, schedules, images, audios and videos related to the themes specified in the form of Words, \*.jpg, \*.avi and others. Ultimately, 10 themes were finalised, and 49 sub-themes were identified to form the national atlas.

Working Groups	Theme	Members
1	Introduction, History, Boundaries, Climate and Physical	Department of Survey and Mapping Malaysia (Chairman) Department of Land and Survey Sabah Department of Land and Survey Sarawak Geospatial Defence Division, DSMM Institute of Language and Literature (DBP)
2	Natural Resources and Land Use	Department of Agriculture, Malaysia (Chairman) Department of Agriculture, Sabah Department of Agriculture, Sarawak Department of Forestry, Peninsular Malaysia Department of Forestry, Sabah Department of Forestry, Sarawak Department of Mineral and Geoscience, Malaysia Remote Sensing Agency Malaysia
3	Infrastructure and Public Amenities	Department of Works, Malaysia (Chairman) Federal Department of Town and City Planning, Peninsular Malaysia Department of Town and City Planning, Sabah Department of Land and Survey Sarawak Ministry of Education
4	Socioeconomic	Department of Statistics Malaysia (Chairman) Department of Geography, Faculty of Literature and Social Science, University Malaya, Department of Orang Asli Development
5	Tourism	Tourism Malaysia (Chairman) Department of Survey and Mapping Malaysia

**Table 1: Working Group Members According to Themes**

## 2.1 National Atlas Malaysia's Themes

Unlike most common national atlases, that comprises general themes such as Climate, Physical, Natural Resources, Infrastructure and Politics, additional themes were added into Malaysia's National Atlas, namely History, Socioeconomic and Tourism (JUPEM, 2016). Additional themes were added in hopes that the national atlas will attract a more extensive user, particularly in secondary and tertiary levels of education, and also interest the public apart from those involved directly with geospatial analysis or planning. According to Blok and Versloot (1993), the practice is common, and it is well understood that most national atlas is developed to suit national requirement. In totality, 10 themes and 49 sub-themes were being developed for the national atlas as shown in Table 2. These themes are complemented with current maps, descriptive information, validated statistical graphics and infographics to provide exciting narrative to the users.

The descriptions of the themes in Table 2 are as follows:

### 2.1.1 Introduction

The atlas is introduced by firstly displaying the world maps of locality, politics, time and population which then followed by the same map themes on Asia's continent, Southeast Asia

region and finally Malaysia. More detailed information of the themes can be grasped in large-scale maps of the states in Malaysia.

No	Theme	Sub-Theme
1	Introduction	World Physical World Politics World Time Zone Population Continent Asia South East Asia Malaysia States
2	History	Malaysia across time World Heritage Sites National Heritage Sites Conservations
3	Boundaries	International and state boundaries District, Mukim, City and Town Boundaries Division and District Boundaries (East Malaysia) Federal election boundaries State election boundaries
4	Climate	Temperature Annual rainfall Humidity Evaporation Sun rays
5	Physical	Ranges Mountains and Hills Rivers and lakes
6	Natural Resource	Petroleum and natural gas Metal-based minerals Non-metal based mineral
7	Land Use	West Malaysia forest West Malaysia crops East Malaysia forest East Malaysia crops Urban
8	Infrastructure and Public Amenities	Educational Institute Primary and secondary schools distribution National Service Training Programs Public and private hospitals Sports and recreation Transportation Klang Valley transportation
9	Socioeconomic	Population density Gender ratio Senior citizen population Youth population Dependency ratio West Malaysia aborigines East Malaysia ethnics
10	Tourism	Ecotourism

No	Theme	Sub-Theme
		North and East Coast Zone Central and South Zone East Malaysia Zone Tourist destinations Sabah Parks Diving locations West Malaysia Diving locations East Malaysia

Table 2: Malaysia's national atlas themes and sub-themes

### 2.1.2 History

The History theme brings to a comprehensive approach concerning the past. This theme is divided into 3 subthemes namely World Heritage Sites, National Heritage Sites and Conservation Sites. World heritage sites and national heritage sites indicate locations that have been registered and recognised as heritage sites, while conservation refers to places that are actively engaged in conservation activities. **A sample of the National Heritage Sites Sub-theme of the National Atlas is as shown in Figure 1.**

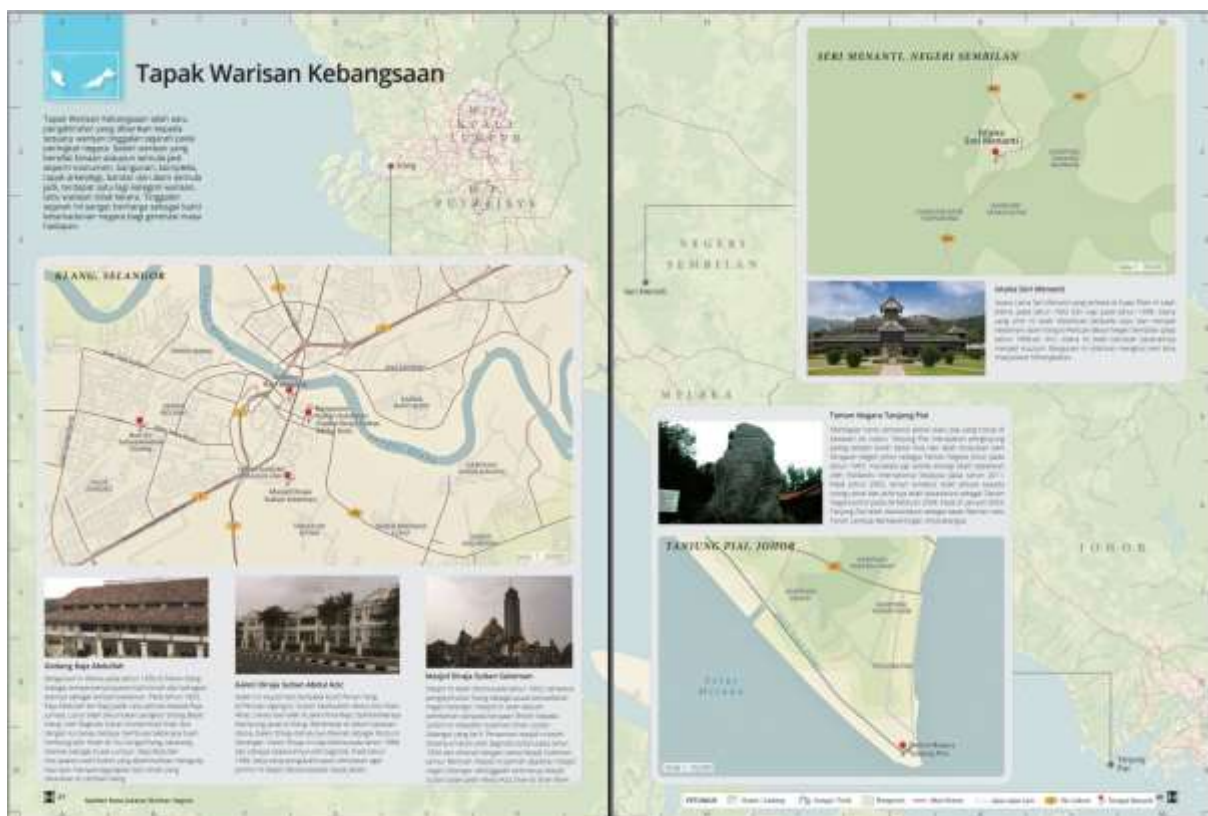


Figure 1: A sample of the National Heritage Sites Sub-Theme under the History Theme of the National Atlas.

### 2.1.3 Boundary

This theme displays administrative boundaries that can also be shown into two sub-themes of political and administrative boundaries. Political boundaries describe the election borders, which refers to parliamentary and constituency's borders. The administrative boundaries illustrate the multi-level administrative jurisdiction boundary of the international, state, district and mukim boundaries.

### 2.1.4 Climate

Climate themes display climate-like concepts such as temperature and rain. Climate factors do influence development in Malaysia from various aspects including agriculture, industry, tourism and socio-economic. This theme is divided into Temperature, Annual Rainfall, Humidity, Evaporation and Solar Rays.

### 2.1.5 Physical

This theme provides the topographic information available in Malaysia. Features like ranges, mountains, hills, rivers and lakes are among the many that have been included in the theme to describe the physical of Malaysia's terrain and its potentials for sustainable land development.

A sample of the Rivers Sub-theme of the National Atlas is as shown in Figure 2.

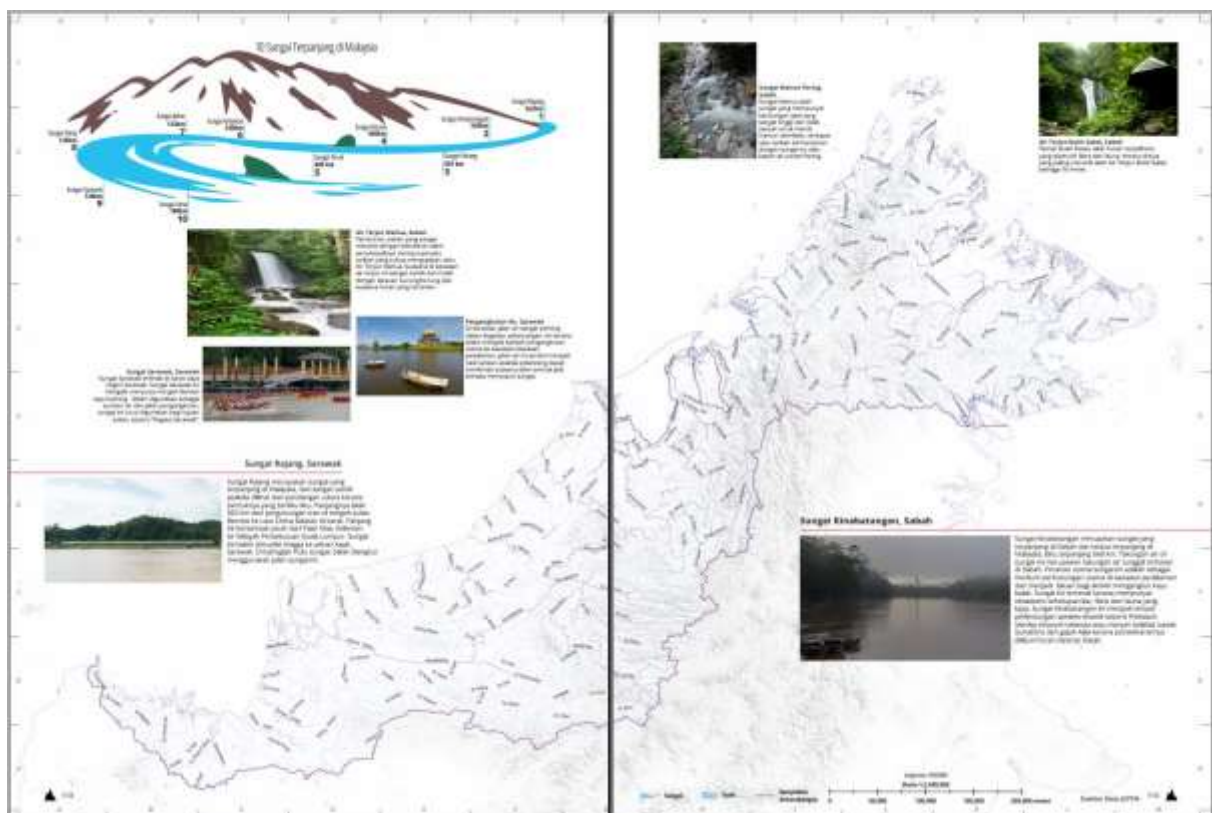


Figure 2: A sample of the Rivers Sub-theme under the Physical Theme of the National Atlas.



### 2.1.6 Natural Resource

The Natural Resources theme gives a more specific look to the natural resources available in Malaysia. Location for petroleum and natural gas as well as other metal and non-metallic minerals are covered in this theme. Each mineral available is shown differently, based on the colour aspect, hardness, volume, chemical composition, lightning, melting force, magnetic attraction etc. A sample of the Petroleum and Natural Gas Sub-theme of the National Atlas is as shown in Figure 3.

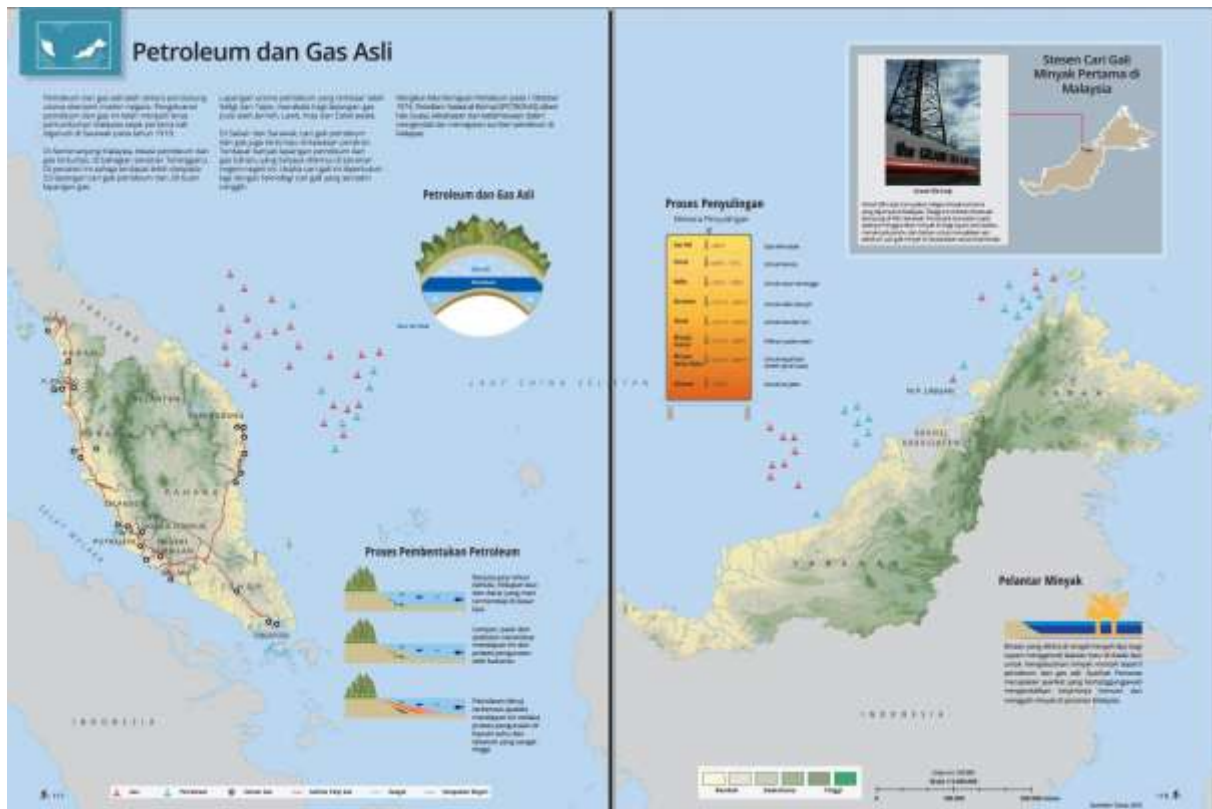


Figure 3: A sample of the Petroleum and Natural Gas Sub-Theme under the Natural Resources Theme of the National Atlas.

### 2.1.7 Land Use

Land use is an activity of optimising land and its natural surroundings into a place for settlement or other human activities. Various types of land use also have a direct impact on the economy such as commercial, industry, agriculture, and housing. This theme focuses on land use activities such as forests, major crops and municipalities.

### 2.1.8 Infrastructure and Public Amenities

Infrastructure refers to basic facilities or services provided by the authorities for the development community. This theme focuses on education, health and transportation. For education, the location of higher education institutes, polytechnics and schools are displayed along with its descriptive information. Health displays the information on health facilities such

as the locality of hospitals as well as sports and recreation amenities. While Transportation features land, water and air transportation facilities.

### 2.1.9 Socioeconomic

Socioeconomics is a theme that translates community life from the economic and social aspects of society. In this theme socioeconomic is described through several subthemes such as Population Density, Gender Ratio, Senior Citizen Population, Youth Population, Dependency Ratio, Orang Asli Peninsular Malaysia as well as Sabah and Sarawak’s ethnic groups. A sample of the Youth Population Sub-theme of the National Atlas is as shown in Figure 4.

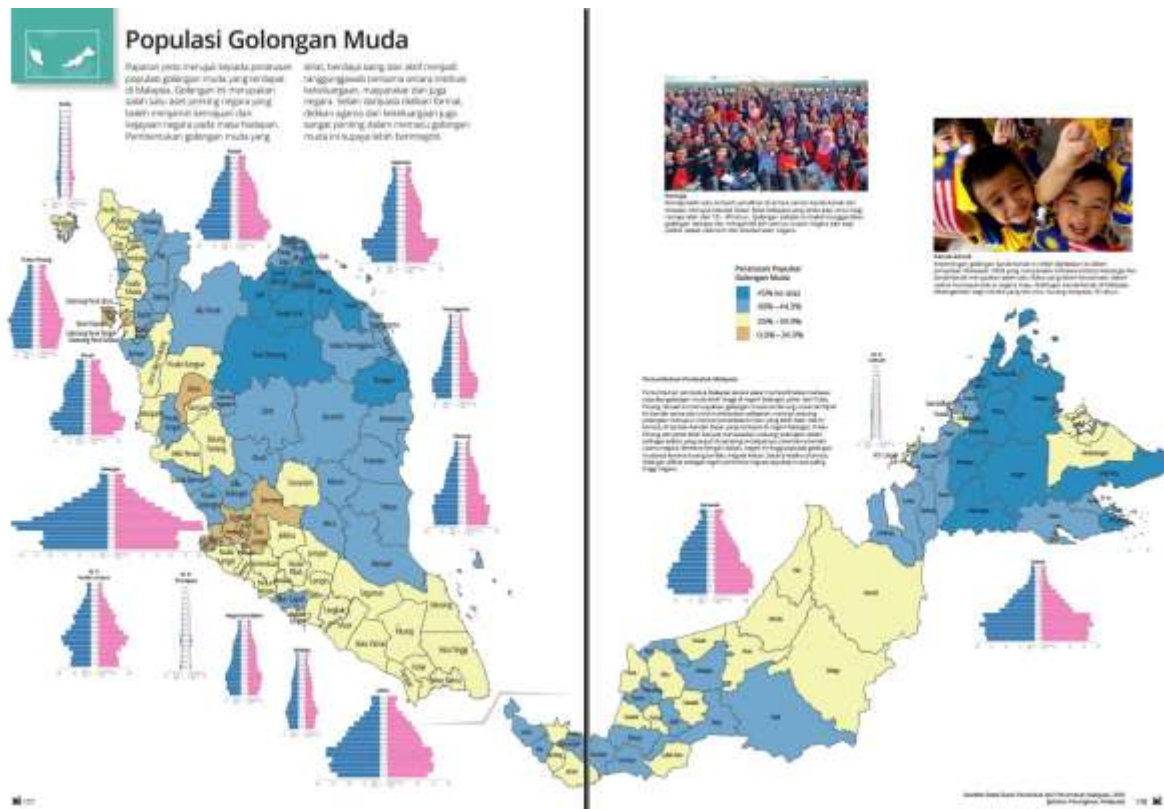


Figure 4: A sample of the Youth Population Sub-theme under the Socioeconomic Theme within the National Atlas.

### 2.1.10 Tourism

This theme introduces Malaysia as tourist destinations for locals or international travellers. The tropical climate of the country makes Malaysia rich and diverse with tourist attractions. In this theme, the location is displayed by tourist destinations by zone, Sabah Parks and locations diving in Peninsular Malaysia and the State of Sabah.

## 3. METHODOLOGY

In general, Figure 1 depicts the process flow carried out in developing Malaysia’s National Atlas. Since the first Malaysia’s national atlas was published almost 30 years earlier, this new

national atlas still maintains the traditional atlas feel of an inventory and descriptive atlases in nature.

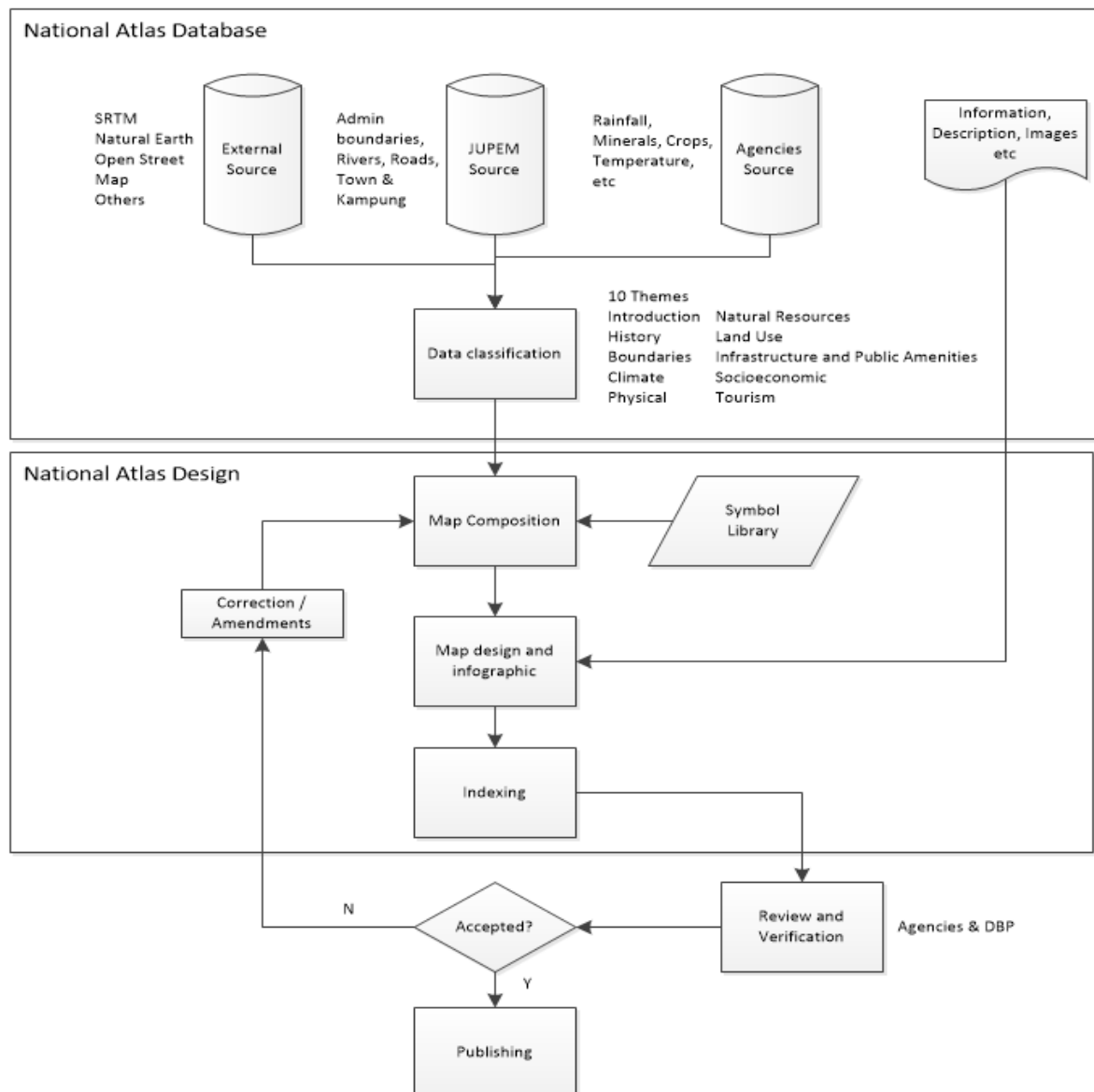


Figure 1: Malaysia's National Atlas development process flow

Three types of data source were identified and recognised as JUPEM Source (Internal), External Source and Agencies Source. For the JUPEM Source database, the dataset utilised for the base map was originally from the topographic medium scale database (1:50,000) that had been generalised and converted into the small-scale topographic database (1:500,000). The base map provides a uniform scale, projection and layout, and thus optimal comparability of the maps. Administrative boundaries, rivers, roads and names of cities, town and kampong, were among the features and attributes accessible as the basis of the national atlas dataset. Shuttle Radar Topography Mission (SRTM) vertical information with 30m accuracy was recognised as one

of the datasets from External Source and became the basis for relief generation. Data and descriptive information related to the relevant themes, such as climate, land use and natural resources that were retrieved from the respectively authorised data custodian, are samples of the many datasets available from the Agencies Source database. All three main data source are central to the development of the national atlas database. Aside from that, the datasets collected were as much as possible to reflect the most recent information for maximum usefulness and in order to allow optimum comparison.

Once the development of the national atlas database was finalised, the data classification process was conducted using the GeoMedia application, where the datasets were classified to meet the 10 designated themes highlighted in section 2.1. Subsequently, the map composition process was done with Adobe Illustrator and Avenza Map Publisher with the relevant thematic symbols adopted from the system's symbol library. Next, the map layout and infographic designed for publishing, using Adobe InDesign. The sequence of the maps was arranged as centripetal. Users can explore the national atlas by starting from the earth's view as a whole, then zoom in to the world's continents view, followed by Asia, South East Asia and afterwards Malaysia as a country and finally the fourteen states. These maps were edited and redrawn to be presented at a similar level of generalisation and hierarchical classification to allow comparison.

Writing materials comprising of statistical information, graphics and images were also added in the process. Accompanying text makes the atlas feels more like a book where one can read from one page with maps, graphs and images to another, telling the story of the subject of the theme designated. Innovative and engaging design were made to the wide-ranging content to allow easy access and user-friendly atlas. Considering that minor or major revisions of the national atlas do not require any less work from the later, therefore, it is imperative for the date of sources to be mentioned as near to the maps, so users are aware of any outdated information. Chronological information, especially to fluctuating dataset such as population, was added to guide users the relative value of the displayed infographics.

Next, the index was created. The indexing for the national atlas utilises the combination of geographical coordinates and alphanumeric grids. The reason to adopting the combination was to cater more experienced users to better understand the actual location of the map on the globe and the real world, and to assist novice users to point the specific location on the map based on the grid's quadrant.

Consequently, the national atlas verification process was conducted iteratively where all relevant parties including JUPEM, agencies and data provider validate the atlas content either accepted for publishing, amendments or omitted from the atlas. Since Malaysia's National Atlas was decided to be published in the national language, the final assessment of the atlas was conducted by the Institute of Language and Literature or locally known as Dewan Bahasa dan Pustaka to review words and expressions used such as the vocabulary, terminology and standards.

Lastly, after almost 18 months, the national atlas was finalised and published by JUPEM in the year 2016. A digital version of the national atlas was also made available for readers and can be viewed via the internet.

## **4. ISSUES AND RECOMMENDATIONS**

In preparing the national atlas, some issues and challenges were identified. Based on Malaysia's own experience, recommendations are also highlighted in this section.

### **4.1 Data**

A national atlas brings together materials from a wide range of sources and makes them available to the public. The data format received and compiled from the various agencies were of different formats (\*.shp, \*.dwg, \*.dgn, \*.csv, etc.) and the metadata was incomplete of relevant information such as datum and map projections. As a result, the data transformation and conversion process were tedious and comprised some trials and errors. Metadata should be set as compulsory to all data providers to enable smooth data conversions.

### **4.2 Map Scale**

Malaysia comprises of East and West Malaysia. The physical separation of both regions by the South China Sea required the map layout to be extended further and published in an odd format, for a uniform and optimal scale to be applied for the national atlas. The situation is unavoidable. Therefore, consideration should be made for choosing map scale that includes the purpose of the maps, the complexity of the mapped area, extension and size of the mapped area, sheet format, importance of the mapped area to the users and the ability to allow map comparison. Some flexibility can be attained and applied in making the national atlas by using half pages, quarter pages, double pages, and landscape or portrait orientation of maps.

### **4.3 Time constraint**

The time given to complete the national atlas was only a year and was hurried due to financial restraint. In spite of that, all 10 themes were completed within the time frame. Typically, the time taken to complete a national atlas by other countries was approximately three years. Consideration, however, must be made to ensure the currentness of the datasets if the time required for the completion of a national atlas is too lengthy.

### **4.4 Research Group**

Producing a national atlas can be considered a major scientific project. A research group of experts on the relevant domains together with the support of cartographers should be formed earlier to pilot the preparation of the national atlas. The research group can assist the NATC and its working groups by determining the significance of datasets and its relationship, the data conversion processes and the suitability of data and information to be mapped according to the identified themes. Among the subjects that can be studied include identifying data availability,

compatibility and suitability, differences of data classifications, map projections, the level of generalisations, optimal scale and data currentness. The result of the study could find the gaps in data and underline a more feasible and thorough process for the project to prevent repetitively or out of context tasks during the project implementation.

#### **4.5 Heterogeneous data quality**

Aside to different existing data formats, map projections and incomplete information due to format conversion, some agencies datasets were found irrelevant to the themes. Therefore, since time is of the essence, the delay caused by the quality of data and the extra work for data vetting, testing and editing have led to exhaustion of time and resource specifically during the development of national atlas database and map composition process. The lack of experts also contributed to the delay of the vetting and editing process. To overcome this, a pilot study on the data conducted by a research group could assist in producing homogenous data quality. Apart from that, full time and dedicated editor is desirable to oversee the data vetting and editing.

#### **4.6 Lack of cooperation**

The realisation of a national atlas is a complicated matter to ensure accuracy, reliability and completeness. Therefore it requires interdisciplinary cooperation among data providers, geospatial experts and cartographers. Lack of cooperation and commitments among members are undesirable. The action could hinder the improvement of a map representation on a subject in a theme. Dedication should be instilled to all members that the development of a national atlas is a national pride and the quality of the atlas produced reflects the image of the members and the country as well.

#### **4.7 Language**

Due to time restriction, the English version was not accounted in the preparation of the national atlas. Therefore, foreigners may find difficulty in reading the national atlas unless they understand the national language; Bahasa Malaysia. Instead of a dedicated local and English edition, the national atlas can be suggested to be published as a bilingual version, particularly on the narrative texts, legends and information. However, the move may result in other issues such as a major revision to the infographic design and readjustment to the map scale of the existing national atlas. Hence, a bilingual version may be suitable and considered to countries who may for the first time produce a national atlas or require a major revision of their current national atlas.

#### **4.8 Revision**

It should be noted that the datasets utilised in the production of Malaysia's national atlas were collected at a specific period. Therefore, outdated information is unavoidable upon the atlas publication in 2016. It is suggested that fast-changing information (fluctuating) be avoided in the national atlas. However, if it is required, the representation of the data can be in a

chronological form to allow users to analyse the data trends and make their own conclusion or future predictions. Unless a significant correction or amendment is required, a cost-benefit ratio study is recommended to determine whether the revision exercise is worth time, energy and resource. Nevertheless, a specific time interval, i.e. every five years, may be suggested to review the currentness of the national atlas.

## **5 NATIONAL ATLAS FUTURE WORKS**

### **5.1 Interactive National Atlas**

A digital version of Malaysia's national atlas (e-book) is also available, but further analysis or query could not be made to a flat file format. At most, users can only peruse the atlas content. Moreover, exposure to interactive maps such as Google Maps, on the Internet encourages the map user to explore alternative methods of representation that may lead to better map use skills and exploration. Therefore, in meeting the revolution of Web 3.0 users who are easily spatially enabled, an interactive national atlas for Malaysia is highly desirable in the near future.

Consideration, however, should be made that the interactive national atlas is to serve a large population of users, from the novice user to the specialist researcher. Apart from that, previous researchers (Aditya & Kraak, 2006; Fowler, 2005) have found that familiarity and simplicity are essential to interactive atlas projects. According to their study, users do not crave highly specific topics, and that maps showing information based on complex calculations and excessive expert interpretations do not interest the user. In addition to this, a study conducted by Richmond and Keller, 2002 suggested that in developing interactive maps (atlas), among the features that are in demand includes should possess interactive capabilities like zooming in/out, hyperlinked map to infographics or webpages, hyperlinked maps with other maps, panning, flexible layers and animation. The advantage with interactive and digital national atlas is incorrect and outdated maps, or information can be amended and replaced easily. However, it should be the intention for any future works of the national atlas to never lose sight of the purpose of it being developed and for whom it was made. The differences of a Geographic Information System and an Atlas Information System should be understood by developers. Thus, interaction and multimedia components should be managed carefully, so the emphasis is on the visualisation of geographic information and cartographic representation of the atlas, to assist users in developing visual analysis, evaluation, interpretation and manipulation.

### **5.2 English Version National Atlas**

As stated earlier in this paper, a national atlas can be a cultural ambassador as well as a source for geospatial information transfer that enables international comparability. Considering the English language is a vibrant and international language, with most of the world's population converse in it as either their first, second or third language, an English version is deemed necessary to fulfil the purpose of the national atlas (Blok & Versloot, 1993). Since the bilingual version requires a major revamp of the existing edition, it was decided an English version of the published 2016 Malaysia's national atlas will be prepared in the near future to cater the international audience.

## 6 CONCLUSION

This paper has provided explanations on the components of Malaysia's national atlas, the methodology, issues and recommendations, as well as future works. It can be stressed from this atlas project that the development of the national atlas was indeed a complex and no trivial matter. Nevertheless, by publishing the national atlas, it is hoped the dissemination of popularised but authoritative scientific information about the geography of Malaysia from a national perspective can be achieved. Apart from that, the purpose of the national atlas is also seen inline in supporting the Sustainable Development Goal, where such atlases can present, synthesise, analyse and explore the real world.

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## **BIOGRAPHICAL NOTES**

Nur Zurairah Abdul Halim and Zoher Nomanbhoy, both are at present surveyors attached with the Cartographic & GIS Division, Department of Survey and Mapping, Malaysia. They are currently reviewing the Malaysia National Atlas, 2016 publication edition for revision and enhancement.

Mohd Noor Isa is currently the Director General of Mapping and Survey Malaysia and has been holding the post since 2016.