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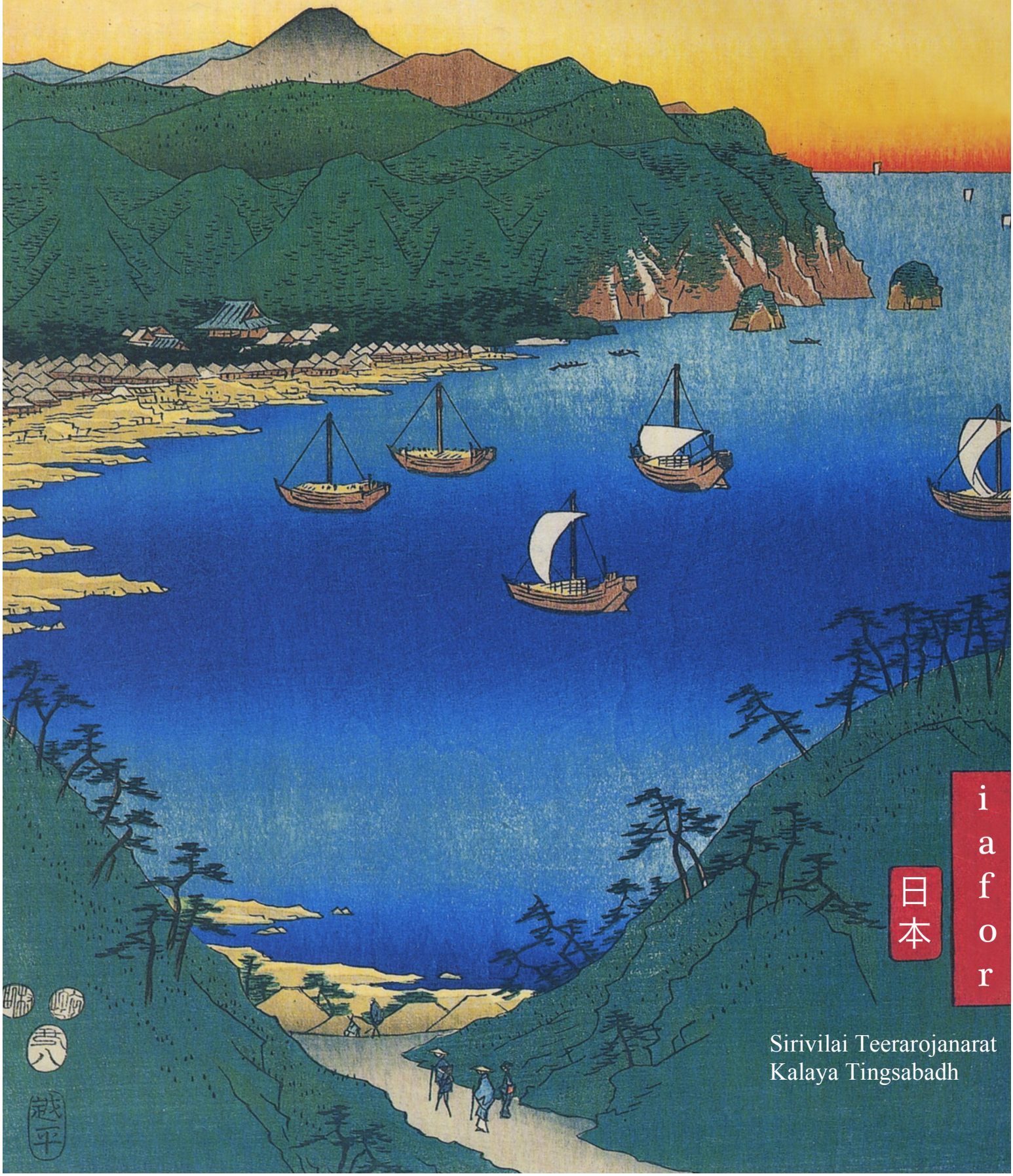

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Mapping Spatial Ongoing Change of Thai dialects: A Case of Transition Area of Central Thai, Northern Thai, and Northeastern Thai

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INTRODUCTION

Thai language comprises four main dialects – Northern Thai, Northeastern Thai, Central Thai, and Southern Thai. Their names imply parts of the country where these dialects are spoken. Over the past four decades many studies in Thai dialectology have been carried out to give new knowledge on dialect variation in various aspects. Dialect ongoing change[1] is one of the main concerns. Up to now the observation of ongoing change among these dialects has been scrutinized in many studies both in terms of tonal and lexical aspects, however, spatial presentation of dialect ongoing change has been usually disregarded or left obscured. Overlay technique and map presentation for the comparison of dialect ongoing change, for example, has been roughly marked by visual estimation on paper maps. Distortion of mapping spatial change can be exaggerated due to the use of copied paper map source in different scales. Such superficial presentation may result in the creation of map with a small degree of accuracy and precision in locating the area of changes.

Geographical Information System (GIS) has been recently used in the area of linguistics to overcome or, at least, lessen drawbacks of map display. GIS is a computer system designed for managing spatial data (Heywood et al., 2002; Longley et al., 2005). GIS provides a database linking spatial features to their attributes and the capabilities in handling spatial information. The GIS-based Linguistic Geography of Thailand Project under the sponsorship of Chulalongkorn University was initiated in 2009 to promote the use of GIS in the field of linguistics. The project allows the integration of scholars from different fields of knowledge to work together, in this case, geographer and linguist. A series of research work has been carried out since then such as the research work of the Word Geography Maps of Thailand Project producing a geographic database of 170 Thai dialect vocabularies covering the whole of Thailand (Teerarojanarat and Tingsabadh, 2008; 2011a) and the Word Geography Maps of the Northeastern Thai Dialect Project producing a geographic database of 298 Northeastern Thai dialect vocabularies covering the whole of the Northeast region of Thailand (Teerarojanarat and Tingsabadh, 2011b). These exemplified research works have proved that GIS is a powerful tool to facilitate the handling of dialect data, mainly for data storage, analysis, and cartographic display.

As far as the study of Thai dialectology is concerned, this paper differs from most previous studies in that investigating the spatial pattern of dialect ongoing change is the main focus. The spatial-based technique using GIS is integrated with the conventional linguistic approach in order to help spatially explore, compare, and map the ongoing change of Thai dialect vocabularies. It is expected that using such integrated technique will enable linguists to explore dialect ongoing change in the spatial aspect more clearly both in terms of its rate and its pattern. In the following sections, the study area and its scope, the applied methodology, results and discussion are given in order.

[1] When two generations of speakers use language differently linguists say that there is variation by age. Such variation shows that ongoing change is taking place. Change eventually takes place when all of the speakers in a community no longer use a language or some features that once occurred in a language.

STUDY AREA AND SCOPE OF STUDY

The study area covers five provinces of Thailand, including Uttraradit, Phitsanulok, Loei, Phichit, and Phetchabun (see Figure 1). Geographically, Uttraradit is considered as part of the Northern region of Thailand, Loei as part of the Northeastern region, and Phitsanulok, Phichit and Phetchabun as part of the upper Central region. This area has been observed in many Thai dialect studies as the transition area[2] of Central Thai, Northern Thai, and Northeastern Thai (Rinprom, 1987; Chutiwat, 1991; Burusphat, 1992). As shown in Figure 2, separation of the dialect differences in this area can be explained, in part, by the influence of topography differences and waterways which forms the early patterns of population settlement and migration - the dominance of mountain ranges and mountainous areas of the North, the fertile valley of the Central Plain, and the rolling surface and undulating hills of the Korat Plateau of the Northeast (Teerarojanarat and Tingsabadh, 2010). In this study where ongoing change in the usage of Central Thai, Northeastern Thai, and Northern Thai is the main interest, spatial variation of the phenomenon in these 5 provinces will be investigated. A pilot study of this issue was carried out by Iamwanthong (n.d.). It confirmed that the set of semantic units given below and the questionnaire method could be used to investigate the topic to be investigated here. That study however only used hand drawn maps to show preliminary results.

METHODOLOGY

Methodology of the study was divided into two main parts. The first part involved the questionnaire collection and analysis of dialect data mainly performed by the linguistic technique while the second part primarily involved the GIS techniques to produce dialect maps and their ongoing change.

2.1 Questionnaire collection and analysis of dialect data

In this part, linguistic approach played a key role in handling data collection and making the analysis of lexical classification and grouping in the observed area. A questionnaire with 15 questions - each representing a semantic unit - was constructed. These semantic units comprise (1) flower name "ดอกกระถิน" (Leucaena leucocephala (Lamk.) de Wit), (2) flower name "ดอกบานไม่รู้โรย" (Gomphrena globosa Linn), (3) "ฟักทอง" (pumpkin), (4) "มะละกอ" (papaya), (5) vegetable name "มะระ" (Momordica charantia L.), (6) "ข้าวหนัก" (rice), (7) "ปลาหมอ" (anabus), (8) "จิ้งเหลน" (skink), (9) "ไม้กวาด" (broom), (10) "กางเกง" (trousers), (11) "พระ" (monk), (12) "โกหก" (to lie), (13) "ฉลาด" (clever), (14) "เบื่อ" (bore), and (15) "ขันตักน้ำ" (water bowl). In brief they comprise some flowers, vegetables, fruits, animals, utensil types, verbs and adjectives Selection of the semantic units was based on the results of several previous studies which commonly indicated that these semantic units can be used to identify the separation of the main Thai dialects, such as the research work of Panupong (1986), Rinprom (1987) and Burusphat (1992).

[2] The transition area, so-called the zone of transition, is considered as the area where the mixture of dialects is spoken. In the transition area, it is rather difficult for linguists to decide which dialect is dominant and where the boundaries should be drawn on map (Chambers and Trudgill, 1980)

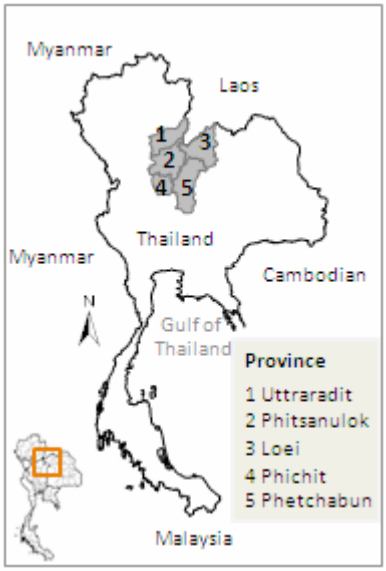


Figure 1: Map of Thailand and the study area.

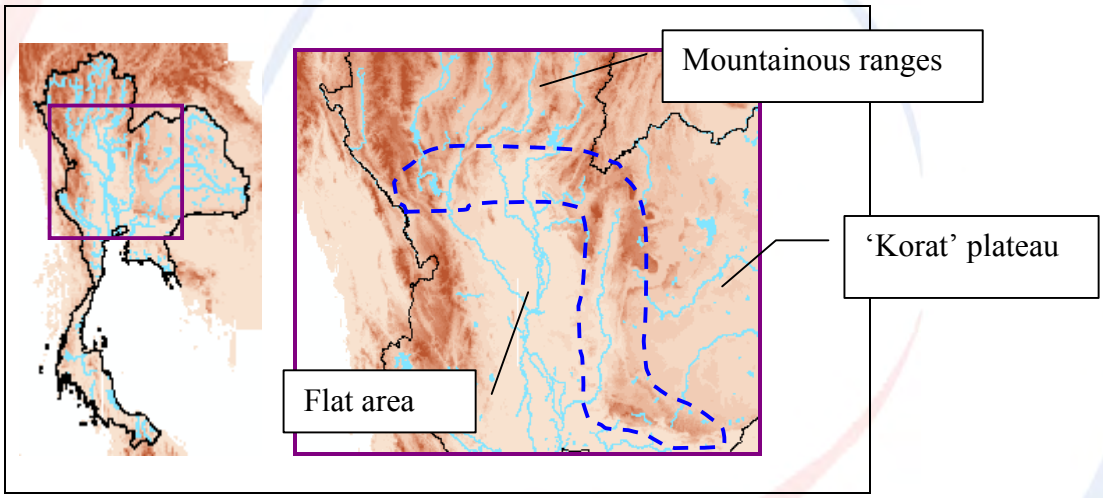


Figure 2: The topographic characteristics of Thailand with the magnified area of the upper Central region, the Northern region and the Northeastern region (Teerarojanarat and Tingsabadh, 2010).

In this study, the technique of apparent time was used to observe the dialect ongoing change. With this technique, data of at least two different age groups were compared. In our case, the two chosen age groups were the elders (people aged between 50 and 60) and the young generation (people aged between 10 and 20).

The questionnaire was sent in December 2010 to secondary and high schools in all 5 observed provinces covering 465 subdistricts, so-called tambon in Thai, in the first and second round by post. The data used in this study came from 1041 schools covering 411 subdistricts or about 88% of the study locations. The informants were a director or a teacher of a school. Data collection was completed within 5 months.

Based on the dialect data collected from schools at subdistrict level, analysis was performed by classifying the lexical items or words of each semantic unit in two

steps. Firstly, dialect vocabularies from the previous research works and dialect dictionaries as well as the measurement of the relative degrees of lexical similarity were used in this study to identify the separation of the main Thai dialects as shown in Table 1. Secondly, for each semantic unit, lexical items or words were then grouped into five categories. Three groups were classified based on the main Thai dialects - Central Thai, Northern Thai, and Northeastern Thai. The other two groups accounted for local dialects and other languages. Table 1 lists the classification of the lexical items or words of the 15 semantic units used in the study.

Table 1: A list of semantic units and lexical classification used in the study.

No.	Semantic Unit	Words/lexical items used to represent the main Thai Dialects		
		Central Thai	Northern Thai	Northeastern Thai
1	**ดอกกระถิน** (Leucaena leucocephala (Lamk.) de Wit)	ดอกกระถิน /dɔ:k^{T} kraʔ^{T} thin^{T}/	ดอกคำใต้ /dɔ:k^{T} kham^{T} ta:i^{T}/	ดอกส้มป่อย /dɔ:k^{T} som^{T} pɔi^{T}/
2	**ดอกบานไม่รู้โรย** (Gomphrena globosa Linn)	ดอกบานไม่รู้โรย /dɔ:k^{T} ba:n^{T} mai^{T} ru:^{T} ro:i^{T}/	ดอกตะล่อม /dɔ:k^{T} taʔ^{T} lɔm^{T}/	ดอกสิบปีเหี่ยว /dɔ:k^{T} sip^{T} pi:^{T} hiau^{T}/
3	**ฟักทอง** (pumpkin)	ฟักทอง /fak^{T} thɔ:ŋ^{T}/	มะฟักแก้ว /maʔ^{T} fak^{T} kɛ:u^{T}/	บักอึ /bak^{T} ʔɯʔ^{T}/
4	**มะละกอ** (papaya)	มะละกอ /maʔ^{T} laʔ^{T} kɔ:^{T}/	บะก้วยเต้ด /baʔ^{T} kuai^{T} te:t^{T}/	บักฮุง /bak^{T} huŋ^{T}/
5	**มะระ** (Momordica charantia L.)	มะระ /maʔ^{T} raʔ ^{T}/	บ่าห่อย /ba:^{T} hɔi^{T}/	ผักไส่ /phak^{T} sai^{T}/
6	**ข้าวหนัก** (rice)	ข้าวหนัก /kha:u^{T} nak^{T}/	ข้าวปี้ /kha:u^{T} pi:^{T}/	ข้าวงัน /kha:u^{T} ŋan^{T}/
7	**ปลาหมอ** (anabus)	ปลาหมอ /pla:^{T} mɔ:^{T}/	ป๋าสะเด็ด /pa:^{T} sa^{T} det^{T}/	ปาเข็ง /pa:^{T} kheŋ^{T}/
8	**จิ้งเหลน** (skink)	จิ้งเหลน /ciŋ^{T} le:n^{T}/	จั๊กก่าเล้อ /cak^{T} ka:^{T} lɤ:^{T}/	ขี้โกะ /khi:^{T} koʔ^{T}/
9	**ไม้กวาด** (broom)	ไม้กวาด /ma:i^{T} kwa:t^{T}/	ญู /ɲu:^{T}/	ฟอย /fɔ:i ^{T}/
10	**กางเกง** (trousers)	กางเกง /ka:ŋ^{T} ke:ŋ^{T}/	เตี่ยว /tiau^{T}/	โส่ง /so:ŋ^{T}/
11	**พระ** (monk)	พระ /phraʔ ^{T}/	ตุ๊ /tuʔ^{T}/	คูบา /khu:^{T} ba:^{T}/
12	**โกหก** (to lie)	โกหก /ko:^{T} hok^{T}/	ขี้จุ๊ /khi:^{T} cuʔ^{T}/	ขี้ตั๋ว /khi:^{T} tua^{T}/
13	**ฉลาด** (clever)	ฉลาด /chaʔ^{T} la:t^{T}/	หลวก /luak^{T}/	เซียง /siaŋT/
14	**เบื่อ** (bore)	เบื่อ /bɯa^{T}/	ก้าย /ka:i^{T}/	เปิด /pɤ:t^{T}/
15	**ขันตักน้ำ**	ขันตักน้ำ	สลุง	โอ

	(water bowl)	/khan^{T} tak^{T} na:m^{T}/	/saʔ^{T} luŋ^{T}/	/ʔo:^{T}/

It should be noted that the questionnaire was designed to allow each informant to choose more than one lexical item to reflect dialect usage in his/her location as it was expected that more than one dialect is used in a large number of locations in the five provinces under study. Results, produced from questionnaire collection and analysis of dialect classification, were eventually the main data source for producing dialect maps of the study in the next step.

2.2 Creation of dialect map and quantification of the rate of ongoing change

GIS was mainly employed in this part. Primarily it was used for storing dialect data, mapping the distribution of dialect pattern and its ongoing change pattern as well as quantifying the rate of ongoing change. At first, GIS contributed to the development of word geography database through lexical item storage. Lexical items or words of each semantic unit, classified as one of the five dialect groups from the previous step, were then coded as a variable identifying whether they are Central Thai, Northern Thai, Northeastern Thai, local dialect or other languages. For each semantic unit, an administrative boundary map of Thailand, obtained by courtesy of the Ministry of Transportation (MOT), was then linked to lexical items to create a new lexical variation map showing the variation of words or lexical items at different localities.

Figure 3 and Figure 4 shows examples of a lexical/word variation map of the semantic unit "to lie", spoken by the elders and the young generation in order. For each semantic unit, the lexical item(s) gathered in each questionnaire representing the whole subdistrict were used as the basis for identifying the type(s) of dialect as shown in Table 1 and symbolized in the form of different coloring circles. These circles are shaded in yellow to represent the locations speaking Central Thai, magenta the locations speaking Northern Thai, blue the locations speaking Northeastern Thai, gray the locations speaking local dialects and black the locations speaking other languages. Moreover, at a location where the three dialects are used equally, a circle is shaded in green, and a location with no data is left blank or unshaded. Degree of lexical usage was also symbolized in a circle based on the following criteria:

- For each location, if only one dialect (e.g. Northern Thai) is spoken, the whole circle will be shaded in one color (e.g. magenta).
- For each location, if two dialects (e.g. Northern Thai and Central Thai) are spoken equally, the circle will be displayed in two halves. The first half of the circle will be shaded based on the color of the first dialect used (e.g. magenta) and the second half will be shaded based on the color of the second dialect used (e.g. yellow).
- For each location, if one dialect (e.g. Central Thai) is spoken greater than another dialect (e.g. Northern Thai), three quarters of the circle will be shaded based on the majority dialect (e.g. yellow) and one quarter of the circle will be shaded with the minority dialect (e.g. magenta).

Based on the above shading criteria, the lexical variation maps of 15 semantic units producing from two age groups - the elders and the young generation - were created. To sum up, a total of 30 lexical variation maps were produced.

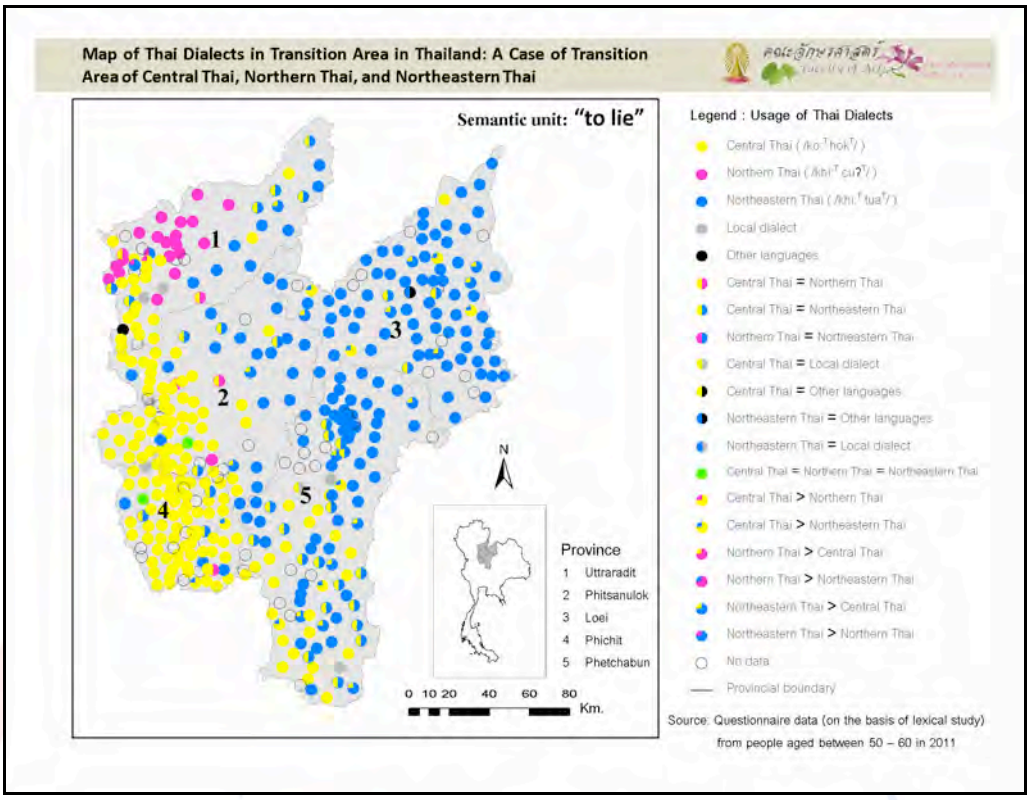


Figure 3: A lexical/word variation map of the semantic unit "to lie", spoken by the elders (people between the ages of 50 and 60).

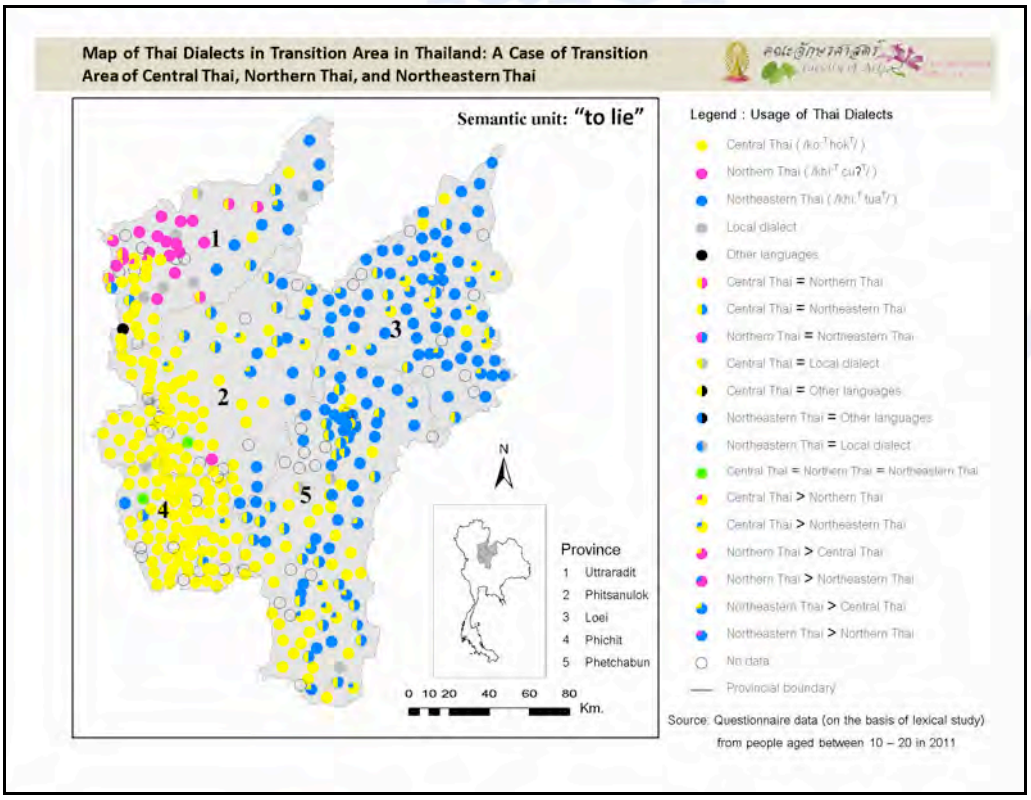


Figure 4: A lexical/word variation map of the semantic unit "to lie", spoken by the young generation (people between the ages of 10 and 20).

The lexical variation maps described above were then used to compare and analyze dialect ongoing change between the two age groups. A technique of "spatial join" analysis on the basis of "intersect" operation within a GIS environment was then performed to match a join point to a target point at the same location (ESRI, 2012). It should be remarked that each point represents a subdistrict location. With this technique, a 'table join' in which fields from one lexical variation map's attribute table of one age group will be appended to a lexical variation map's attribute table of another age group based on the relative locations of the features in the two maps. As a result, for each semantic unit a dialect ongoing change map containing dialect data of both age groups was created for comparison. In the next section, results and discussion of ongoing change detection will be given.

RESULTS AND DISCUSSION

Final results of the study, the spatial comparison of dialect ongoing change, were presented in two ways: table showing the quantification of their ongoing change and maps showing the pattern of dialect ongoing change. It should be noted that owing to the fact that people of two age groups - the elders (people between the ages of 50 and 60) and the young generation (people between the ages of 10 and 20) - were compared, it was thus assumed that the dialect usage of the past and the present time with the approximation of 30 years apart was observed.

The first type of results, dialect ongoing change map, was produced to compare the spatial pattern of dialect observed from the two age groups. In this study, 2 versions of the ongoing change map were produced. Each version produced 15 ongoing change maps (each representing 15 semantic units of two age groups in comparison), but with different techniques. Maps of the first version, as shown in Figure 5, map the locations of ongoing change and non-ongoing change. With this kind of map, the pattern of spatial ongoing change can be detected. Maps of the second version, as shown in Figure 6, provide more details about the types of dialects spoken by the two age groups in comparison. With this technique, the dialect ongoing change of each location is symbolized as a circle in that the left half of the circle is shaded based on the lexical usage of the elders and the right half is shaded according to the lexical usage of the young generation. Similar to the color regime of a lexical variation map, shading colors is as follows: yellow for Central Thai, magenta for Northern Thai, blue for Northeastern Thai, gray for local dialects, black for other languages, green for the mixture of the three Thai dialects - Central Thai, Northern Thai, Northeastern Thai, and finally no shade for no data location. It should be noted that for each half of a circle, two colors can be shaded equally as two quarters in case that two dialects are spoken in that half.

Another type of result was in the form of tables showing the quantification of dialect ongoing change. Table 2 shows the overall dialect ongoing change of the observed 15 semantic units. According to the table, the number of ongoing changes observed from the available 456 subdistricts of the study locations was calculated in the unit of percentage for comparison. It should be noted that only the direct ongoing changes between the 3 main Thai dialects - Central Thai (C), Northern Thai (N) and Northeastern Thai (NE) were the main focus in this paper. The mixing of these main

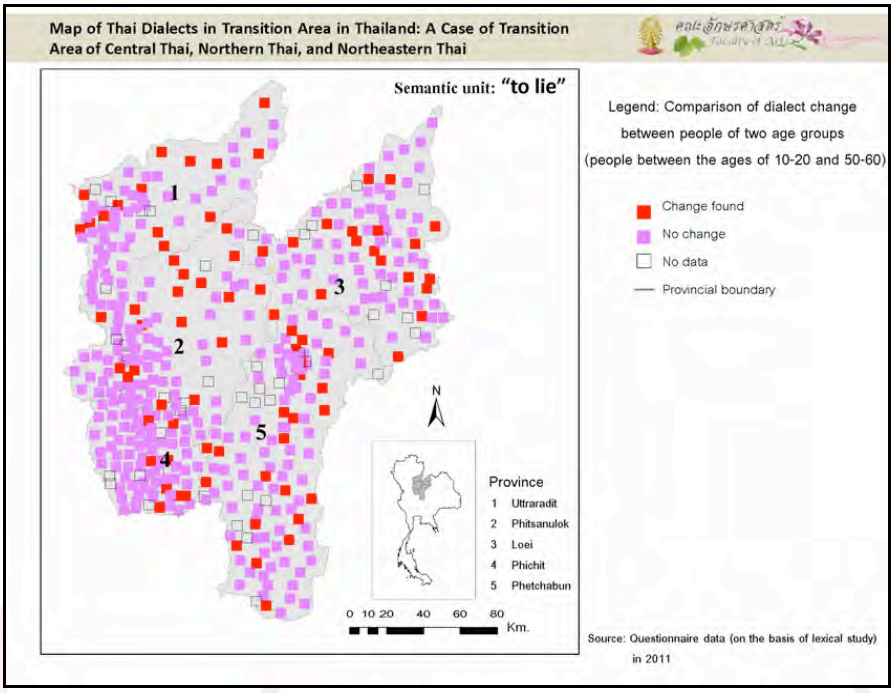


Figure 5: A dialect ongoing change map of the semantic unit "to lie", observed from the elders (people between the ages of 50 and 60) and the young generation ((people between the ages of 50 and 60) in comparison.

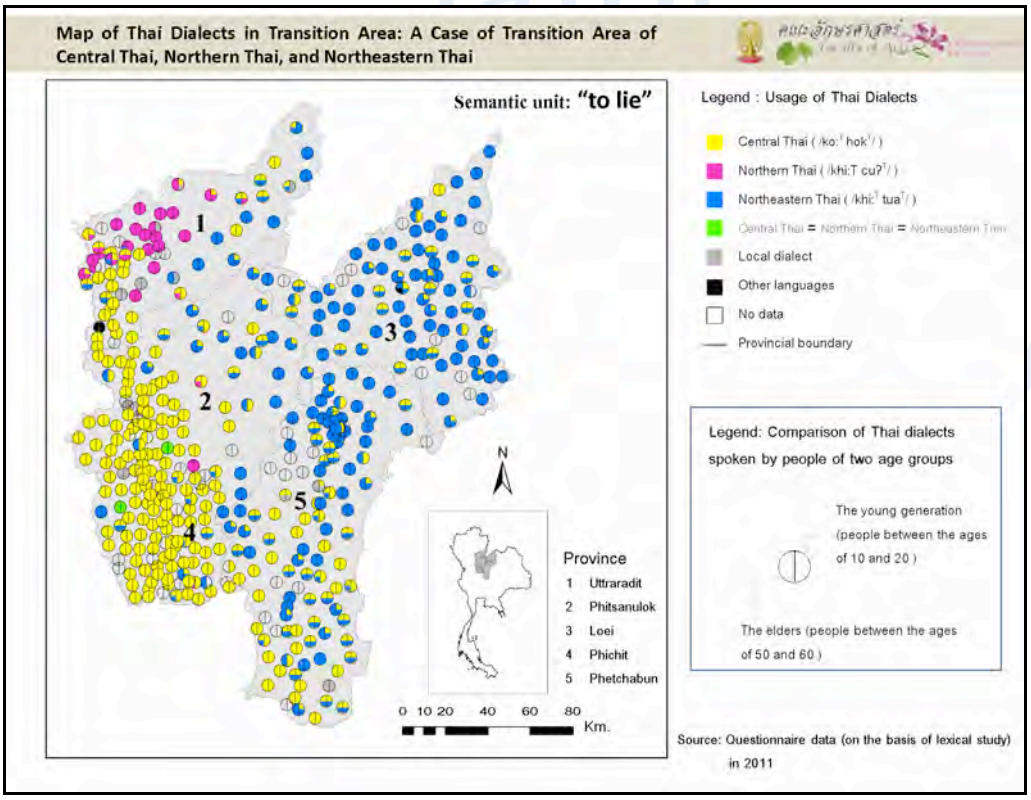


Figure 6: A dialect ongoing change map of the semantic unit "to lie", observed from the elders (people between the ages of 50 and 60) and the young generation ((people between the ages of 50 and 60) in comparison.

dialects such as the mixing usage of Central Thai and Northern Thai were also included to investigate the gradual ongoing change during the observed period. For example, the column "C to N" includes the direct ongoing change from Central Thai to Northern Thai, the gradual ongoing change from Central Thai to the mixing usage of Central Thai and Northern Thai, and the gradual ongoing change from the mixing usage of Central Thai and Northern Thai to Northern Thai. Other types of ongoing change, however, such as the ongoing change from Central Thai to Local dialect were omitted and not discussed.

According to the results obtained, some noticeable points can be concluded. Firstly, ongoing change can be detected from a 30-year period. Degrees or rates of ongoing change ranged from 5% to 35% on different semantic units (see Table 2). On the whole, all semantic units show that no particular ongoing change was dominant.

Secondly, when observing only the direct ongoing change of the 3 main dialects, it is obvious that the number of ongoing changes were quite minimal (2% to 15%) (see Table 2). Among these, 3 semantic units ("W1" **ดอกกระถิน** (Leucaena leucocephala (Lamk.) de Wit), "W13" **ฉลาด** (clever), and "W15"**ขันตักน้ำ** (water bowl)) showed very little ongoing change (the percent of "Sum of change type" < 5%). This implies that these 3 semantic units hardly represented the ongoing change in the study area. Summarized as graph shown in Figure 7, it could be concluded that among all of these semantic units, ongoing change was found mostly from Northern Thai and Northeastern Thai to Central Thai - at the average rate of 1.46% and 7.26% respectively. The ongoing change from Central Thai to Northern Thai and Northeastern Thai was hardly found - at the average rate of 0.29% and 0.60% respectively. It can be concluded that ongoing changes from Northeastern Thai to Central Thai were much higher.

Thirdly, further investigation on the ongoing changes from Northeastern Thai and Northern Thai to Central Thai was performed. According to the first case, semantic units having the ongoing change of > 5% were chosen for examining the ongoing change from Northeastern Thai to Central Thai (see Figure 8). Comparison between *the direct* ongoing change (from Northeastern Thai to Central Thai (NE->C)) and *the gradual* ongoing change (from Northeastern Thai to the mixing usage of Northeastern Thai and Central Thai (NE->NE&C) and the mixing usage of Northeastern Thai and Central Thai to Central Thai (NE&C->C)) were examined. The finding is that the gradual ongoing change was found mostly from Northeastern Thai to the mixing usage of Northeastern Thai and Central Thai (NE->NE&C). Only two semantic units, "W2" **ดอกบานไม่รู้โรย** (Gomphrena globosa Linn) and "W5" **มะระ** (Momordica charantia L.), had the highest rate of *direct* ongoing change (from Northeastern Thai to Central Thai (NE->C)). In another case, semantic units having the ongoing change of > 2% were chosen for investigating the ongoing change from Northern Thai to Central Thai to compare the occurrence of *the direct* ongoing change and *the gradual* ongoing change (see Figure 9). The ongoing change was found mostly from the mixing usage of Northern Thai and Central Thai to Central Thai (N&C->C). Only one semantic unit, "W6" for **ข้าวหนัก** (rice) had the highest rate of *the direct* ongoing change (from Northern Thai to Central Thai (N->C)).

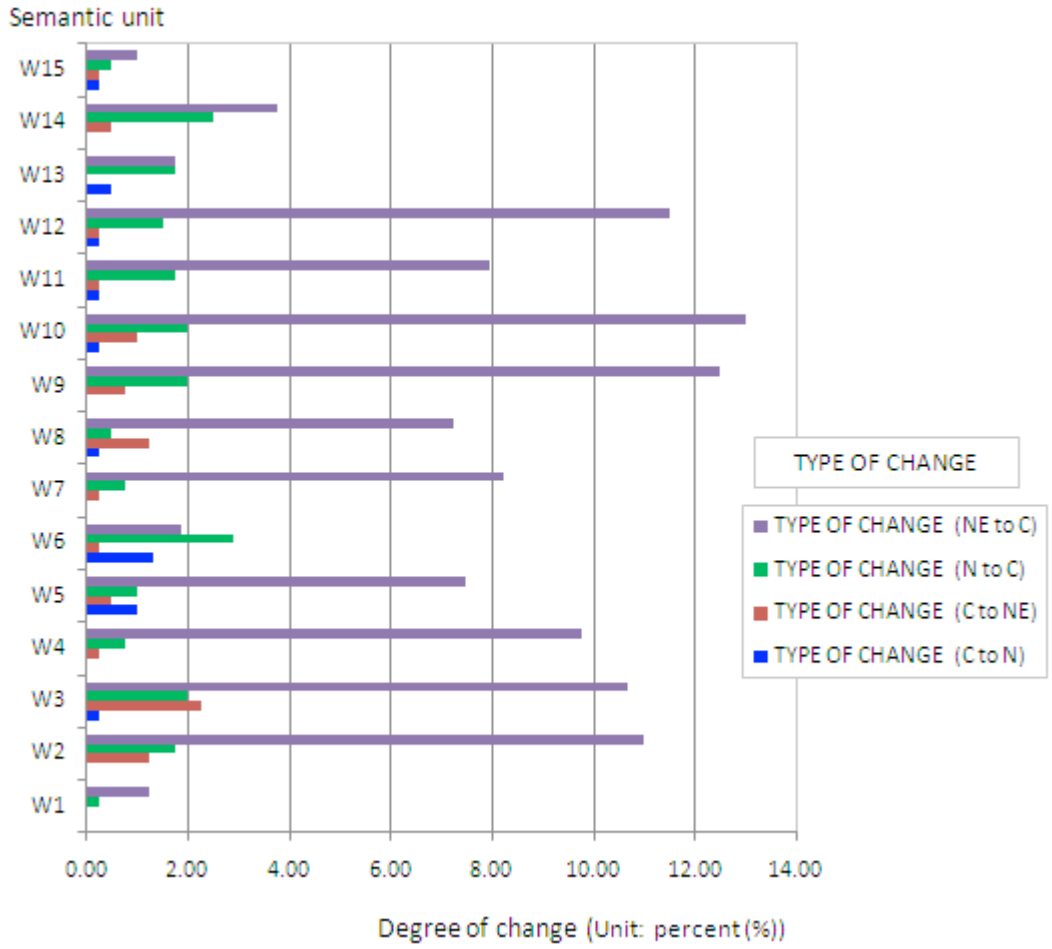
Table 2: Comparison of the degree of the dialect variation by age of the 15 semantic units observed from the study locations (unit: percent).

Semantic unit	NO ongoing change			Sum of NO ongoing change	TYPE OF ongoing change				Sum of ongoing change Type	Other types of ongoing change	Total
	C->C	N->N	NE->NE		C to N	C to NE	N to C	NE to C			
W1	94.03	0.25	1.24	95.53	0.00	0.00	0.25	1.25	1.50	2.97	100.00
W2	62.09	2.49	12.22	76.80	0.00	1.25	1.75	10.97	13.97	9.23	100.00
W3	45.34	2.27	14.86	62.47	0.25	2.26	2.00	10.65	15.16	22.37	100.00
W4	48.99	3.77	15.83	68.59	0.00	0.25	0.75	9.80	10.80	20.61	100.00
W5	60.85	1.25	15.71	77.81	1.00	0.50	1.00	7.48	9.98	12.21	100.00
W6	77.51	10.05	3.44	91.00	1.31	0.26	2.91	1.85	6.33	2.67	100.00
W7	61.10	0.50	16.46	78.06	0.00	0.25	0.75	8.23	9.23	12.71	100.00
W8	49.75	4.25	23.75	77.75	0.25	1.25	0.50	7.25	9.25	13.00	100.00
W9	52.37	0.25	12.97	65.59	0.00	0.75	2.00	12.47	15.22	19.19	100.00
W10	48.25	0.25	14.50	63.00	0.25	1.00	2.00	13.00	16.25	20.75	100.00
W11	63.43	0.50	4.23	68.16	0.25	0.25	1.75	7.96	10.21	21.63	100.00
W12	40.00	23.75	3.50	67.25	0.25	0.25	1.50	11.50	13.50	19.25	100.00
W13	81.41	3.02	0.75	85.18	0.50	0.00	1.76	1.76	4.02	10.80	100.00
W14	72.86	2.51	3.27	78.64	0.00	0.50	2.51	3.77	6.78	14.58	100.00
W15	83.46	0.00	2.51	85.97	0.25	0.25	0.50	1.00	2.00	12.03	100.00

Remark:

1. In the "Semantic unit" column, the abbreviation of "W1" stands for **ดอกกระถิน** (Leucaena leucocephala (Lamk.) de Wit), "W2" for **ดอกบานไม่รู้โรย** (Gomphrena globosa Linn), "W3" for **ฟักทอง** (pumpkin), "W4" for **มะละกอ** (papaya), "W5" for **มะระ** (Momordica charantia L.), "W6" for **ข้าวหนัก** (rice), "W7" for **ปลาหมอ** (anabus), "W8" for **จิ้งเหลน** (skink), "W9" for **ไม้กวาด** (broom), "W10" for **กางเกง** (trousers), "W11" for **พระ** (monk), "W12" for **โกหก** (to lie), "W13" for **ฉลาด** (clever), "W14" for **เบื่อ** (bore), "W15" for **ขันตักน้ำ** (water bowl).

2. In the “NO ongoing change” column, the abbreviation of “C” stands for Central Thai, “N” stands for Northern Thai, and “NE” stands for Northeastern Thai.
3. In the “TYPE OF ongoing change” column, the abbreviation of “C to N” stands for the combination of the ongoing change from Central Thai to Northern Thai, from Central Thai to the mixing usage of Central Thai and Northern Thai, and from the mixing usage of Central Thai and Northern Thai to Northern Thai, “C to NE” stands for the combination of the ongoing change from Central Thai to Northeastern Thai, from Central Thai to the mixing usage of Central Thai and Northeastern Thai, and from the mixing usage of Central Thai and Northeastern Thai to Northeastern Thai. “N to C” stands for the combination of the ongoing change from Northern Thai to Central Thai, from Northern Thai to the mixing usage of Central Thai and Northern Thai, and from the mixing usage of Central Thai and Northern Thai to Central Thai, “NE to C” stands for the combination of the ongoing change from Northeastern Thai to Central Thai, from Northeastern Thai to the mixing usage of Central Thai and Northeastern Thai, and from the mixing usage of Central Thai and Northeastern Thai to Central Thai.
4. The symbolic “->” stands for the ongoing change of dialect usage in approximately 30 years.

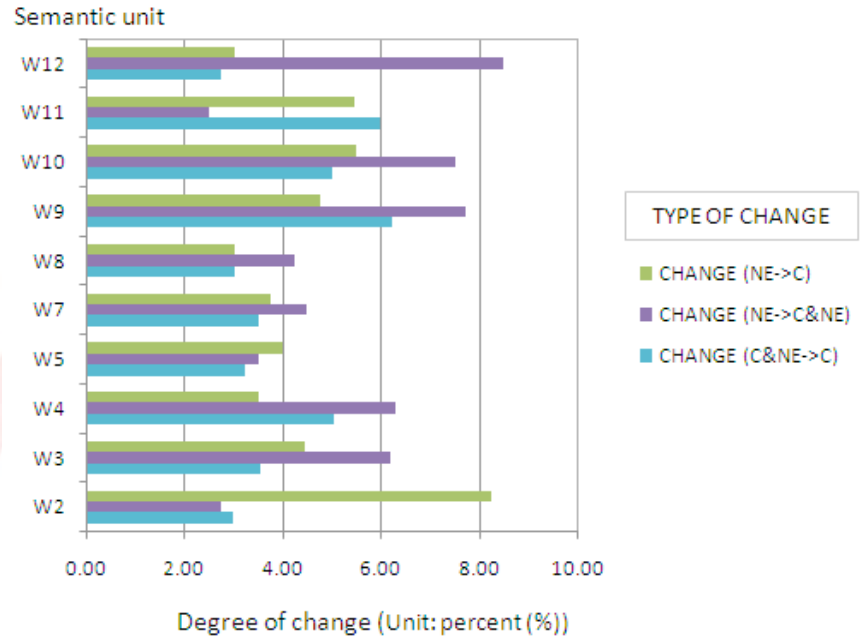


Remark:

1. In the "Semantic unit" axis, the abbreviation of "W1" stands for **ดอกกระถิน** (Leucaena leucocephala (Lamk.) de Wit), "W2" for **ดอกบานไม่รู้โรย** (Gomphrena globosa Linn), "W3" for **ฟักทอง** (pumpkin), "W4" for **มะละกอ** (papaya), "W5" for **มะระ** (Momordica charantia L.), "W6" for **ข้าวหนัก** (rice), "W7" for **ปลาหมอ** (anabus), "W8" for **จิ้งเหลน** (skink), "W9" for **ไม้กวาด** (broom), "W10" for **กางเกง** (trousers), "W11" for **พระ** (monk), "W12" for **โกหก** (to lie), "W13" for **ฉลาด** (clever), "W14" for **เบื่อ** (bore), "W15" for **ขันตักน้ำ** (water bowl).
2. According to the legend, the abbreviation of "NE to C" stands for the combination of the ongoing change from Northeastern Thai to Central Thai, from Northeastern Thai to the mixing usage of Central Thai and Northeastern Thai, and from the mixing usage of Central Thai and Northeastern Thai to Central Thai, "N to C" stands for the combination of the ongoing change from Northern Thai to Central Thai, from Northern Thai to the mixing usage of Central Thai and Northern Thai, and from the mixing usage of Central Thai and Northern Thai to Central Thai, "C to NE" stands for the combination of the ongoing change from Central Thai to Northeastern Thai, from Central Thai to the mixing usage of Central Thai and Northeastern Thai, and from the mixing usage of Central Thai and Northeastern Thai to Northeastern Thai, and "C to N" stands for the combination of the ongoing change from Central Thai to Northern Thai, from Central Thai to the mixing usage of Central Thai and

Northern Thai, and from the mixing usage of Central Thai and Northern Thai to Northern Thai.)

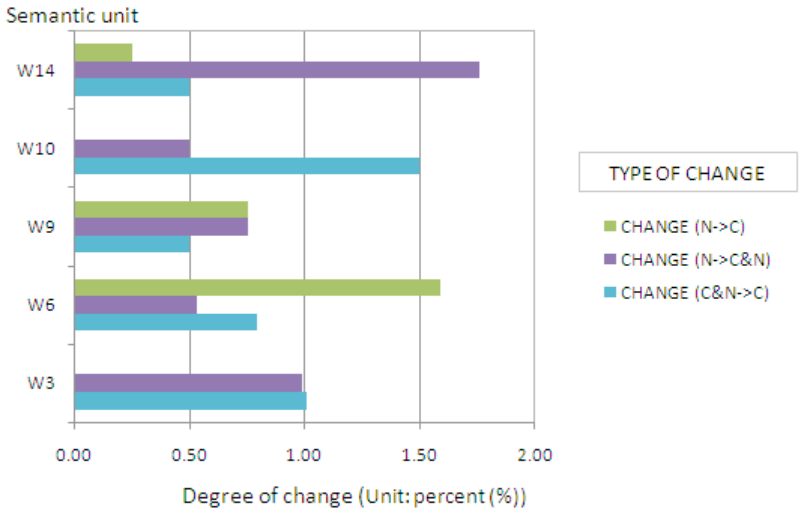
Figure 7: Four types of dialect ongoing change of the observed 15 semantic units in comparison.



Remark:

1. In the "Semantic unit" axis, the abbreviation of "W2" stands for **ดอกบานไม่รู้โรย** (Gomphrena globosa Linn), "W3" for **ฟักทอง** (pumpkin), "W4" for **มะละกอ** (papaya), "W5" for **มะระ** (Momordica charantia L.), "W7" for **ปลาหมอ** (anabus), "W8" for **จิ้งเหลน** (skink), "W9" for **ไม้กวาด** (broom), "W10" for **กางเกง** (trousers), "W11" for **พระ** (monk), "W12" for **โกหก** (to lie).
2. According to the legend, the abbreviation of "change (NE->C)" refers to the ongoing change from Northeastern Thai to Central Thai, "change (NE->C&NE)" refers to the ongoing change from Northeastern Thai to the mixing usage of Central Thai and Northeastern Thai, and "change (C&NE->C)" refers to the ongoing change from the mixing usage of Central Thai and Northeastern Thai to Central Thai.

Figure 8: The rate of ongoing change from Northeastern Thai to Central Thai of the chosen 10 semantic units in comparison.



Remark:

1. In the "Semantic unit" axis, the abbreviation of "W3" for **ฟักทอง** (pumpkin), "W6" for **ข้าวหนัก** (rice), "W9" for **ไม้กวาด** (broom), "W10" for **กางเกง** (trousers), "W14" for **เบื่อ** (bore)..
2. According to the legend, the abbreviation of "change (N->C)" refers to the ongoing change from Northern Thai to Central Thai, "change (N->C&N)" refers to the ongoing change from Northern Thai to the mixing usage of Central Thai and Northern Thai, and "change (C&N->C)" refers to the ongoing change from the mixing usage of Central Thai and Northern Thai to Central Thai.

Figure 9: The rate of ongoing change from Northern Thai to Central Thai of the chosen 5 semantic units in comparison.

According to the above findings, *the gradual* ongoing change was dominant in both cases. It could be summarized that the pattern of ongoing change comprised two stages; (1) ongoing change from dialect A to the mixing usage of dialect A and B and (2) ongoing change from the mixing usage of dialect A and B to dialect B.

Fourthly, the spatial pattern of dialect ongoing change was investigated. Maps having different degrees of ongoing change were compared. The 3 semantic units of "ดอกกระถิน" (Leucaena leucocephala (Lamk.) de Wit), "มะระ" (Momordica charantia L.), and "กางเกง" (trousers) are shown in comparison as an example in Figure 10. These 3 semantic units are different in terms of the rate of ongoing change - "ดอกกระถิน" (Leucaena leucocephala (Lamk.) de Wit) representing the lowest, "มะระ" (Momordica charantia L.) representing the middle, and "กางเกง" (trousers) representing the highest. According to Figure 10, the spreading direction of ongoing change can be detected. From the center of the study area where Phitsanulok province is located, the ongoing change was found as points at the border of the provinces (see Figure 10(a)). In the middle ongoing change as shown in Figure 10(b), the ongoing change at the previous points became centers of clustering. In Figure 10(c) the highest ongoing change was exemplified, these clusters spread out from the centers and became bigger and bigger.

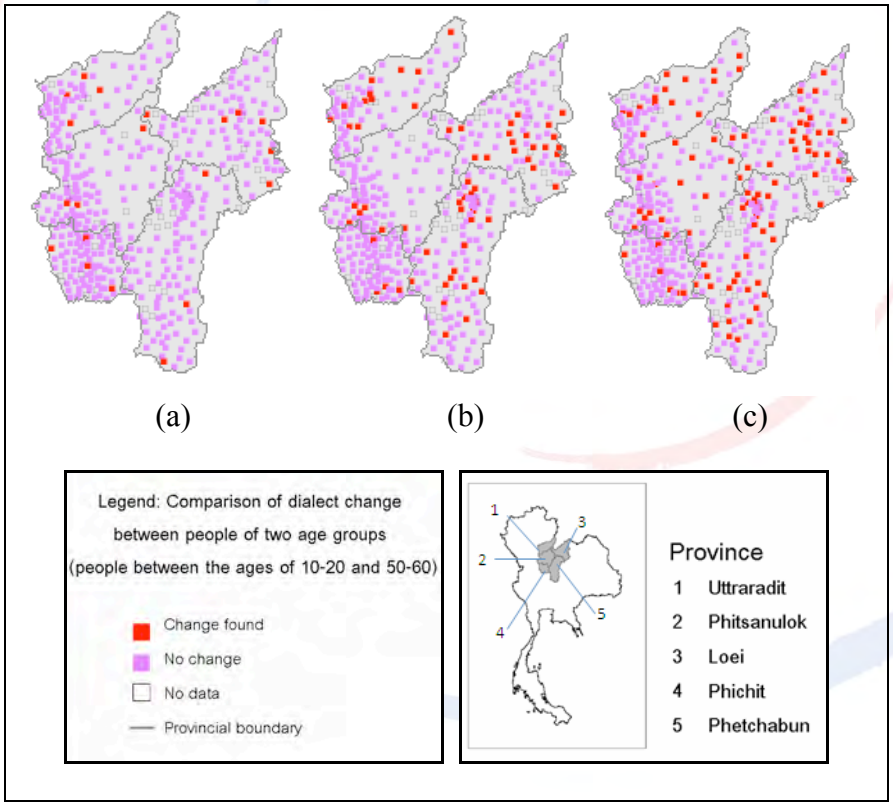


Figure 10: The spatial pattern of dialect ongoing change of 3 semantic units: (a)"ดอกกระถิน" (Leucaena leucocephala (Lamk.) de Wit), (b) "มะระ" (Momordica charantia L.), and (c)"กางเกง" (trousers).

When another version of ongoing change maps was plotted in parallel with maps of the first version as shown in Figure 11, ongoing change of usage between these dialects can be easily observed and examined. (see Figure 11(b), 11(d), and 11(f)). In

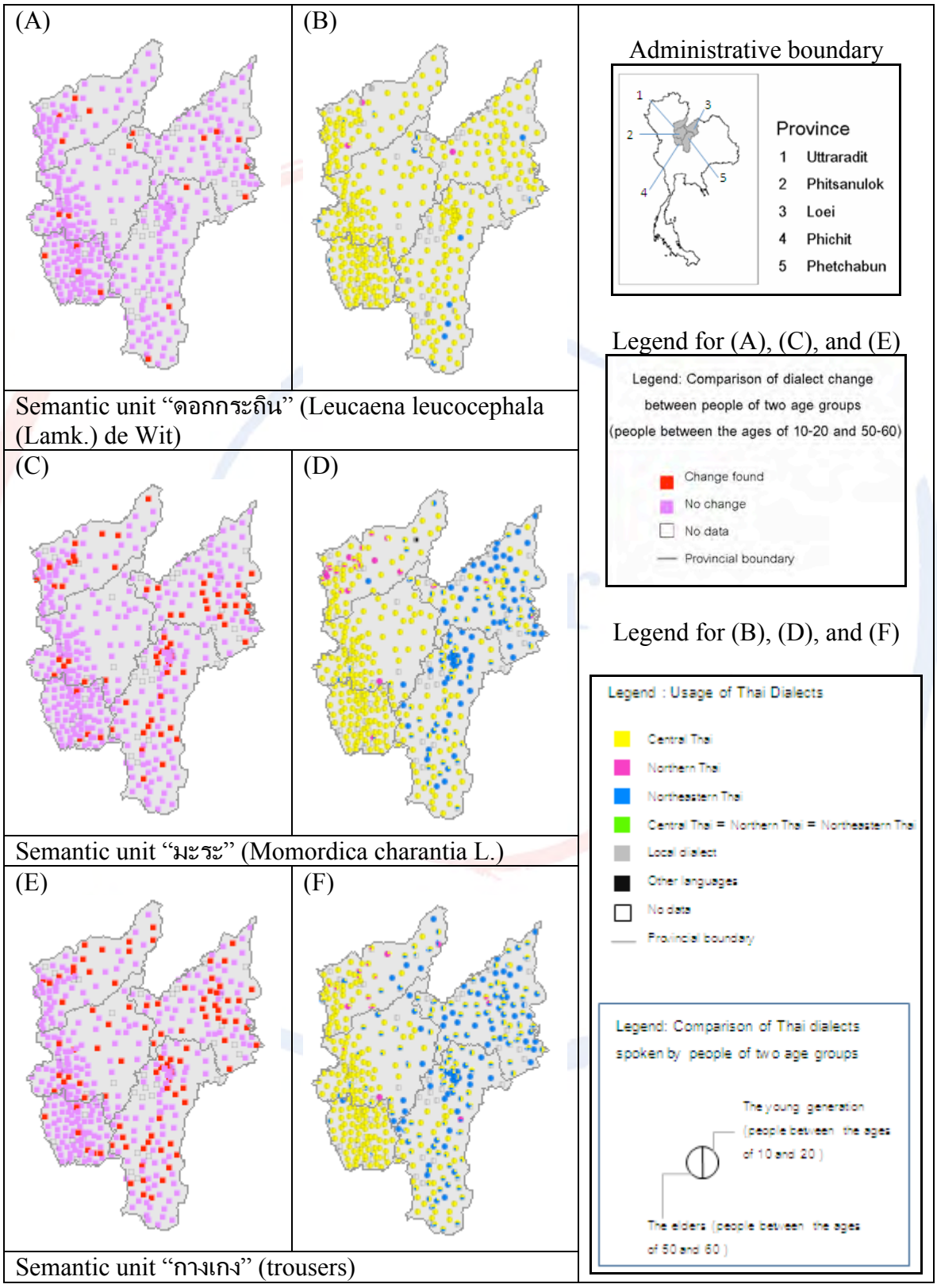


Figure 11: The spatial pattern of dialect ongoing change of semantic unit “ดอกกระถิน” (Leucaena leucocephala (Lamk.) de Wit) , “มะระ” (Momordica charantia L.) and “กางเกง” (trousers) presenting in 2 map versions.

Phitsanulok, it is quite clear that people in this province mainly spoke Central Thai and 'no ongoing change' was prevailing. Some ongoing change, mainly from Northeastern Thai to Central Thai, was found at the eastern and southern border of the province. In the surrounding provinces, ongoing change was found in a different way. Ongoing change from Northeastern Thai to Central Thai was found as clusters in the eastern part of Uttraradit as well as the eastern and southern direction of the study area where Loei, Phetchabun, and Phichit are located. Smaller ongoing change from Northern Thai to Central Thai was also found as clusters in the western part of Uttraradit.

Finally, in order to help explain the clustering patterns of ongoing change, topography and locations of urban areas of each province were given as a reference (see Figure 12). Obviously, the ongoing change occurred around the cores of urban communities. The spread of the clusters were along the flat area in relation to the topography of a study location. The finding thus confirms the effect of topography and locations of urban areas on the shape of the ongoing change patterns. Suggestion to include other physical elements such as river and road transportation, population settlement, is required to further investigate their impact on the pattern of dialect ongoing change.

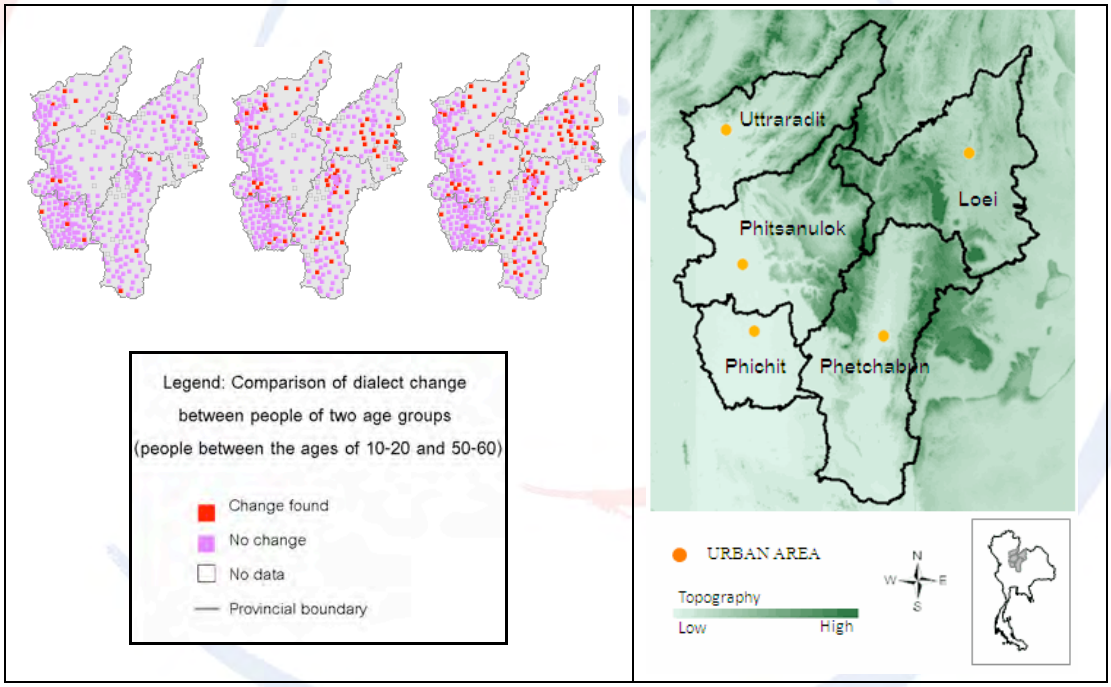


Figure 12: Different degrees of ongoing change patterns compared to topography and urban communities (right).

CONCLUSION

This paper presents an alternative, the integration of linguistic approach and a GIS-based technique, to enhance the way to present and perform spatial analysis of dialect ongoing change mapping as well as to offer the way to quantify the ongoing change. The exemplified work used the lexical study on the basis of the questionnaires collected from people of two age groups in a study location. The findings show that the spatial patterns of dialect ongoing change can be detected variedly on different

semantic units, but with similar patterns. Rates of spatial ongoing change can also be quantified. Mostly, the ongoing change was from Northeastern Thai to Central Thai. The findings through spatial observation and analysis thus confirm the benefit of the integration of GIS to help linguists and researchers to interpret and get better knowledge on dialect change.

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