



## Water Supply and Impact of Water on Tourism in the Upper Part of Northeastern, Thailand in the Next Decade

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### Abstract

In the upper part of northeastern Thailand, there are 5 provinces where main tourist attractions are located. In the next decade, the number of Thai and foreign excursionists, tourists and visitors will gradually increase along with the increasing number of local people. The paper aimed to examine the situations of water supply, and the impact of water on the area and tourism, to investigate the number of rivers, canals and water resources that supply consumers and tourism in the next decade, and to predict the number of excursionists, tourists, and visitors to the amount of water supply and the impact of natural water: flooding and drought to the area for the next decade. The instrument was an interview 25 stakeholders from 12 groups: government and private organizations and local people, and 2 times focus groups. Data collected were analyzed to set up a strategic plan for the area to reserve water for the next decade. As a result, the researcher found that, in the last decade, the amount of water was sufficient for both local communities and tourism industry, there was some impact of flooding occurred only in Buengkan Province; there was no problem of water supply impact to the area both local and tourism industry. For the next decade, the number of local people and tourists will increase gradually, therefore, water supply will not be a problem but the authorized organizations should be concerned about flooding and find the way to control and solve the problems that may happen. Furthermore, cultural, creative and agro-tourism should be improved to promote the number of tourists in the area.

**Keywords:** *Water supply, Impact of water, the effects of water on tourism*

### 1. Introduction

The upper part of northeastern Thailand divided by Phupan mountain range from the lower part; there are 11 provinces, however, this research specified only 5 provinces: Buengkan, Loei, Nongbualamphu, Nongkhai, and Udonthani (Tourism Authority of Thailand, 2009). There is an upper plateau and Sakhonnakorn basin in the area, Loei mountain with average of 1,000 meters above sea level is the origin of 2 rivers: Loei and Songkram rivers flow to Mun and Panieng rivers then merge to Khong River. Phu Kao with the average of 600 meters above sea level is the origin of Huay Luang and flow to Khong River, Pong and Mao rivers flow to Chee River. Phu Pan mountain range which is limestone mountain east of Nong Lahan, Udonthani province. (Tourism Authority of Thailand, 2022) In the area, there are many important rivers, canals, water resources such as Khong River where located between Muang district, Nongkhai and Mukdahan Province. This river is 700 -1,000 meters wide and 15 - 25 meters deep. Loei River, Songkram River, Kam stream, Huay Bangsai, Huay Mook and Huat Bang-E and there are many ponds in the area such as Nong Han 8 kilometers wide and 13 kilometers long, Nong Pansak 5 kilometers wide and 10 kilometers long and Nong Lahan 3 kilometers wide and 10 kilometers long etc. (Tourism Authority of Thailand, 2022). The average of rainfalls approximately 1,474 millimeters, between May to September the average more than 200 millimeters, and the most arid season is in December with the average of rainfalls only 30%. There are diversity and variety of tourist attractions in the area where both Thai and foreign excursionists, tourists and visitors come to visit and spend their money which increase the revenue to the area. (Tourism Authority of Thailand, 2020)

**Table 1** Five provinces in the upper part of northeastern Thailand and tourist attractions located in the provinces

Provinces	Natural Tourist Attractions	Cultural Tourist Attractions	Man-made Tourist Attractions	Customs and Festivals
<b>Buengkan</b> (TAT, 2009)	Caves: Naga Cave Waterfalls: Jet Si, Phu Thamphra Lakes: Bung Khong Long, Nong Kut Ting Mountains: Phu tok Noi, Phu Sing	Temples: Photaram temple, Chetiya Khiri Viharn Chaomae Songnang Shrine	Thai-Laos Flea Market	Rocket Festival, Songkran, Candles parade, Boat racing, Light boat parade
<b>Loei</b> (TAT, 2009)	Kaeng Kutku, Kaeng Ton Phuluang Wild Animal Reserve View Points: Decho, etc. Caves: Pha Pung, Pha Ya etc. Waterfalls: Khun Pong, Chang Tok etc. National Parks: Phu Kadung, Phu Rua	Temples: Si Song Rak, Satcha, Museums: Local Museum Buddha Image Lord Buddha Foot Print City Pillar Shrine Archaeological Sites: Mahoran Cave, Laitang Cave	The Little House in Big Forest Project, Loei Highland Research and Development Sirindhorn Art Center 60 Years of Queen Sirikit Public Park Phu Rua Grape garden Thai-Laos Friendship Bridge Reservoir	Red Cross Fair Si Song Rak Praying Fair Phi Ta Khon Winter Flowers Fair
<b>Nongkhai</b> (TAT, 2009)	Phu Wua Wild Animals Reserve View Points: Tam Prai etc. Waterfalls: Jet Si, Tarn Tong etc. River Beaches: Chom Manee, Sita etc.	Phra Dhat Bang Puan, Phra Dhat Klang Nam Nongkhai Museum Temples: Tam Sri Mongkol, Phochai etc. Buddha images Monument	Tha Sadet Market Aquarium Symbol Shrine Wickerware Village Freshwater Fisherman Village Public Parks	Boat Racing The Celebration of the Victory over the Hor Rebellion Red Cross Fair Rocket Festival Songkran Festival
<b>Nongbualamphu</b> (TAT, 2009)	Hor Sawan View Point Caves: Pha Cho, Pha Wieng etc. Waterfalls Tao To Forest Park Phu Kao-Phu Pankam National Park	Naresuan, the Great Monument Temples: Tam Kong Pen etc. City Pillar Shrine Archaeological Sites	150 million years Stone Shell Museum Reservoirs	Vist Hoi Hin and Longan Fair Luang Pu Kao Praying Fair
<b>Udonthani</b> (TAT, 2009)	Kum Chanod View Points Waterfalls Forest Park Na Yung-Nam Som National Park	Phra Dhat Don Kaew Lord Buddha Foot Print Monument Ban Chiang Museum Temples	Ban Chiang Thai Puan Udon Sunshine Orchid Farm Ban Men Hadicraft Center Na Kha Village	Food Street Fair Rocket Festival Songkran Festival Tung Sri Muang Annual Fair Bang Chiang World Heritage Fair

Source: Tourism Authority of Thailand

## 2. Objectives

- 1) To examine situations of water supply, and the impact of water on the area and tourism
- 2) To investigate the number of rivers, canals and water resources that supply consumers and tourism in the next decade

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3) To predict the number of excursionists, tourists, and visitors to the amount of water supply and the impact of natural water: flooding and drought to the area for the next decade

### 3. Materials and Methods

This paper is qualitative research, the tool of which was an interview with 12 groups of key informants from 2 main groups 1) government organizations 2) private organizations and local people. The number of key informants was obtained through purposive sampling. Twelve key informants were: 1) people who lived in the area, 2) government organizations in the area, 3) interested academics and academic institutions, 4) workers' representative who might be affected positively and negatively, 5) chiefs of the people or influencers, 6) local politicians, 7) NGO agents and social volunteers related to ONWR, 8) NPO in the area, 9) private sectors and entrepreneurs, 10) those who took part in planning and budgeting, 11) plan owners, and 12) the highest chiefs of government offices or the full authorize representative with decision making power. (NESDC, 2020). Secondary data were obtained from textbooks, websites and statistics were collected. Data collected from both sources were classified and categorized. Then, 25 stakeholders from the 2 groups participated in two focus group discussions (with the government representative held in Loei, Nongkhai and Udonthani and with the private organizations and local people held in Buengkan, Loei and Udonthani) to acquire their opinions. Then, data were finalized and integrated into the strategic plan to solve the problems of water supply, conserve and preserve natural water resources for local people and tourism businesses.

### 4. Results and Discussion

Five provinces consist of 57 districts, 419 sub-districts, 4,785 villages, 5 Provincial Administration Organizations, 1 Metropolitan Municipality, 6 Provincial Municipality, 90 Sub-district Municipality and 396 Sub-district Municipality Organizations. There are 3,584,660 people in 5 provinces, Udonthani has the highest number of population (1,544,789) and the average of population density is 98.10 per square kilometers. (BORA, 2021)

**Table 2** Populations in each province of upper part of northeastern region (2019)

Provinces	Populations	Households	Area (km. <sup>2</sup> )	Population density (km. <sup>2</sup> )
<b>Total</b>	<b>3,584,660</b>	<b>1,049,473</b>	<b>34,346.28</b>	<b>98.10</b>
Buengkan	403,542	103,159	4,305	97.74
Loei	624,066	166,243	11,424.612	54.34
Nongkhai	509,395	240,354	3,027.280	168.27
Nongbualamphu	502,868	124,849	3,859.086	129.80
Udonthani	1,544,789	414,868	11,730.302	131.19

Source: The Bureau of Registration Administration

There were many excursionists, tourists and visitors both Thai and foreign who visited Buengkan, Loei, Nongbualamphu, Nongkhai, and Udonthani and the revenue gradually increased every year gradually from 2014 to 2018 as shown in Table 3-7. (Department of Tourism, 2020)

**Table 3** Number of excursionists, tourists and visitors and revenue of Buengkan Province from 2014-2018

Province	Excursionists, tourists, and visitors/revenue	Statistic number of tourists and revenues 2014-2018				
		2014	2015	2016	2017	2018
<b>Buengkan</b>	No. of Thai visitors	530,921	560,393	575,123	596,216	599,471
	No. of foreign visitors	6,206	6,360	6,541	6,756	6,723
	No. Thai tourists	314,527	331,270	335,505	347,340	348,345
	No. of foreign tourists	2,797	2,858	2864	2,945	2,949

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Province	Excursionists, tourists, and visitors/revenue	Statistic number of tourists and revenues 2014-2018				
		2014	2015	2016	2017	2018
	No. of Thai excursionists	216,394	229,123	239,618	248,876	251,126
	No. of foreign excursionists	3,409	3,502	3,677	3,811	3,774
	Revenue (million Baht) Thai	828.18	906.03	964.40	1,041.11	1,057.09
	Revenue (million Baht) Foreign	10.77	11.39	12.21	13.20	13.27

**Table 4** Number of excursionists, tourists and visitors and revenue of Loei Province from 2014-2018

Province	Excursionists, tourists, and visitors/revenue	Statistic number of tourists and revenues 2014-2018				
		2014	2015	2016	2017	2018
Loei	No. of Thai visitors	1,548,723	1,897,358	1,993,768	2,092,365	2,192,198
	No. of foreign visitors	33,228	35,764	37,354	39,160	40,932
	No. Thai tourists	860,108	1,066,972	1,123,644	1,188,934	1,250,676
	No. of foreign tourists	19,562	20,976	21,802	22,660	23,698
	No. of Thai excursionists	688,615	830,386	870,124	903,431	941,522
	No. of foreign excursionists	13,666	14,788	15,552	16,500	17,234
	Revenue (million Baht) Thai	2,591.08	3,251.09	3,606.95	4,036.69	4,480.75
	Revenue (million Baht) foreign	84.39	96.05	104.73	115.90	129.39

**Table 5** Number of excursionists, tourists and visitors and revenue of Nongbualamphu Province from 2014-2018

Province	Excursionists, tourists, and visitors/revenue	Statistic number of tourists and revenues 2014-2018				
		2014	2015	2016	2017	2018
Nongbualamphu	No. of Thai excursionists	164,791	171,541	175,436	188,097	194,467
	No. of foreign excursionists	999	1,119	1,134	1,308	1,346
	No. Thai tourists	162,858	170,938	172,129	186,172	189,355
	No. of foreign tourists	395	444	437	489	503
	No. of Thai visitors	327,649	342,479	347,565	374,269	383,510
	No. of foreign visitors	1,394	1,563	1,571	1,797	1,849
	Revenue (million Baht) Thai	311.73	334.89	348.55	393.26	416.04
	Revenue (million Baht) foreign	1.52	1.76	1.80	2.11	2.25

**Table 6** Number of excursionists, tourists and visitors and revenue of Nongkhai Province from 2014-2018

Province	Excursionists, tourists, and visitors/revenue	Statistic number of tourists and revenues 2014-2018				
		2014	2015	2016	2017	2018
Nongkhai	No. of Thai excursionists	733,559	781,028	815,749	851,054	883,366
	No. of foreign excursionists	470,315	494,842	511,586	540,129	505,343
	No. Thai tourists	1,107,958	1,190,967	1,229,558	1,221,717	1,259,517
	No. of foreign tourists	48,569	50,508	51,607	51,392	52,965
	No. of Thai visitors	1,841,582	1,971,995	2,045,307	2,072,771	2,142,883



Province	Excursionists, tourists, and visitors/revenue	Statistic number of tourists and revenues 2014-2018				
		2014	2015	2016	2017	2018
	No. of foreign visitors	526,981	545,350	563,193	591,521	618,308
	Revenue (million Baht) Thai	3,549.56	3,847.62	4,120.92	4,381.48	4,792.50
	Revenue (million Baht) foreign	627.24	660.07	704.66	771.36	846.11

**Table 7** Number of excursionists, tourists and visitors and revenue of Udonthani Province from 2014-2018

Provinces	Excursionists, tourists, and visitors/revenue	Statistic number of tourists and revenues 2014-2018				
		2014	2015	2016	2017	2018
Udonthani	No. of Thai excursionists	885,915	941,478	969,284	1,038,822	1,089,206
	No. of foreign excursionists	62,233	63,366	64,795	70,452	72,187
	No. Thai tourists	2,050,234	2,163,506	2,192,374	2,386,673	2,471,554
	No. of foreign tourists	75,505	77,158	77,948	85,340	87,510
	No. of Thai visitors	2,936,149	3,104,984	3,161,658	3,425,495	3,560,760
	No. of foreign visitors	137,738	140,524	142,743	155,801	159,697
	Revenue (million Baht) Thai	6,986.10	7,594.76	8,047.61	9,306.15	10,205.18
	Revenue (million Baht) foreign	467.27	489.94	510.80	586.36	636.06

Source: Department of Tourism

The greatest number of tourists and revenue was displayed by Udonthani, and the least displayed by Nongbualumphu. However, after the COVID-19 pandemic in 2019, the decreasing of numbers of domestic and foreign tourists and income in percentage were as follows: Buengkan Thai -4.17% (-44.29), foreign -91.00% (-89.75%), Loei (Thai -36.67% (-45.07%), foreign -87.85% (85.81%), Nongkhai (Thai -43.83% (-50.66), foreign -78.99% (-78.40%), Nongbualamphu Thai -49.67% (-56.32%), foreign -80.01% (-75.77%), and Udonthani Thai -42.65% (-48.52%), foreign -80.55% (-75.66%). In the future, after the decline of COVID-19, the number of tourists and revenue will increase gradually according to the development of tourism plans for each province as the following: 1) Buengkan: Follow the Khong River Civilization Path and develop tourism in all dimensions: ecological, cultural, and the Khong River Civilization tourism to draw attention to the tourists, 2) Loei: The Tourism City, Ecological Tourism along with improve natural resources and environment which is the outstanding point of the province, 3) Nongkhai: Khong River Tourism City and connects to the neighboring country, 4) Nongbualamphu: Promote Tourism Attractions to be Standard and Public-relations to the tourists, 5) Udonthani: Promote MICE Tourism to be MICE center (GMS MICE & Tourism City). The target to promote the 5 provinces to receive more income from tourists. After that, connecting all 5 provinces together and to Laos by studying 6As: accessibilities, attractions, activities, accommodations, amenities, and ancillary services which are the main components to have more tourists and income to the area. The study of the usage of electricity in 2019 represent that there are 981,843 households altogether and there is electricity supply for 859,701 households (87.82%), for the business there was enough amount of electricity and water supply: Buengkan, water can be produced 200,349 million meters<sup>3</sup>, the usage only 197,167 million meters<sup>3</sup> for 7,109 households, Loei, water can be produced 1,253,478 million meters<sup>3</sup>, the usage only 1,118,662 million meters<sup>3</sup> for 43,881 households, Nongkhai, water can be produced 923,393 million meters<sup>3</sup>, the usage only 892,318 for 37,309 households, Nongbualamphu, water can be produced 328,580 million meters<sup>3</sup>, the usage only 315,951 million meters<sup>3</sup> for 13,552 households, Udonthani, water can be produced 3,675,918 meters<sup>3</sup>, the usage only 3,293,937 for 117,303 households, the rest used by all tourism related, therefore, there will be no problems at all in the present day and in the next decade. Not only

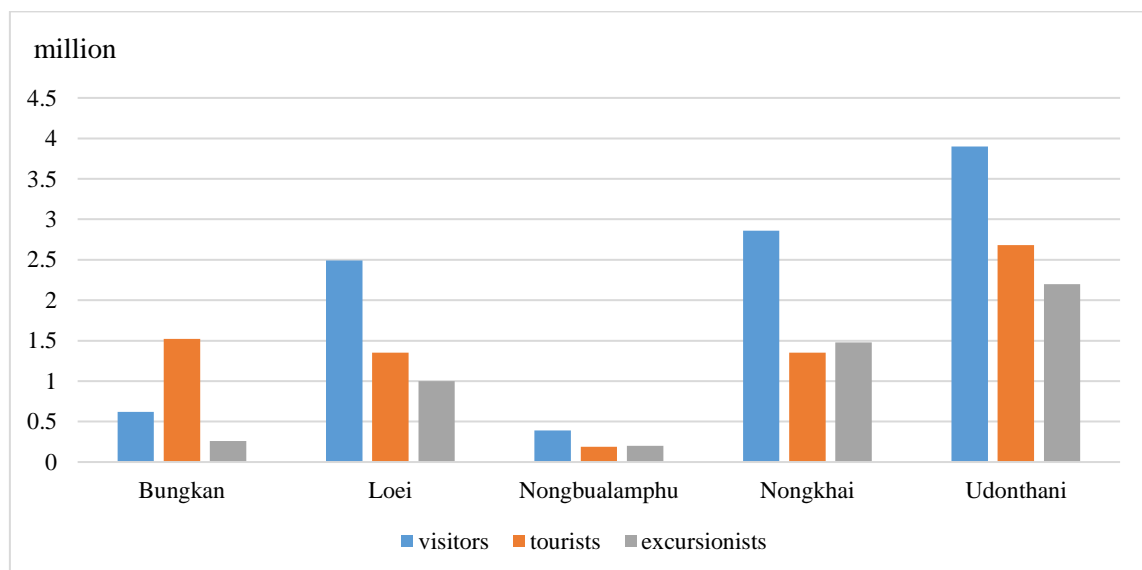
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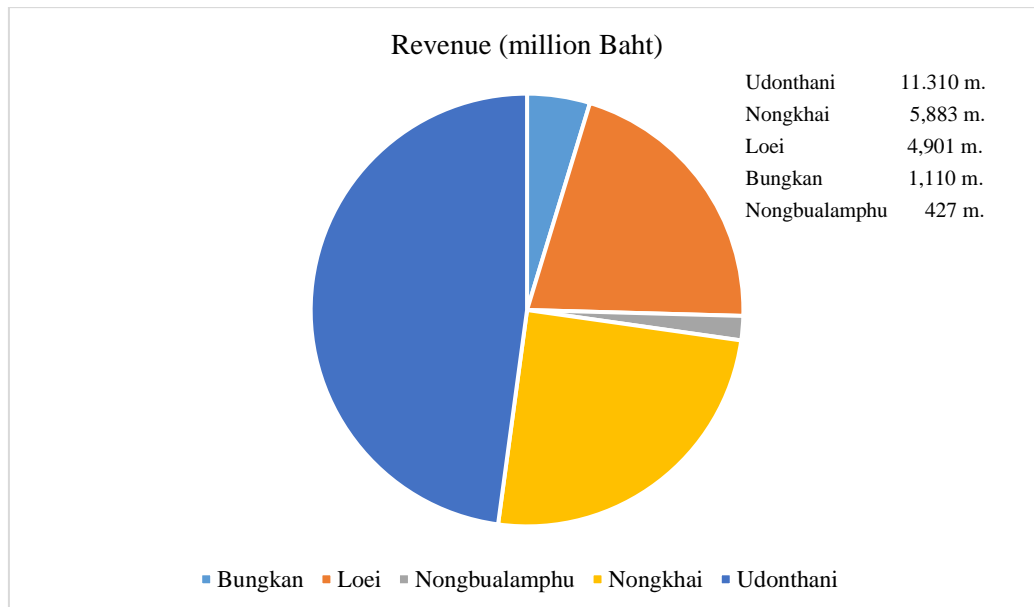
this, there are enough number of rainfalls and plenty of natural water resources in every province in the area. (ONWR, 2019) Two factors from water will impact to the tourism are flooding and drought in the rainy season and dry season accordingly. The last decade, there are many storms affects flooding in the area such as DOKSURI, TALAS, SONCA in 2017 and SON-TINH in 2018, Thailand Water Situation reported that on 31 July 2018, this storm impact to Thai and Laos people which 27 dead 123 losses and 6,600 became homeless. The other factor is drought, in 2016, the volume of water in 4 main dams were less than 2017 about 2,846 million cubic meters. In 2019, dry season came a little bit early than the normal because of El nino phenomenon, the number of rainfalls dropped the average of normal in 30 years from 1,230.90 millimeters to 1,000 millimeters so authorities had to limit the usage of water for agriculture. However, this situation not impact a lot to tourism. (ONWR, 2020). The number of tourists, however, decreased in 2019-2021 due to the pandemic of COVID-19. In 2022, the number of tourists start to come back to the area and for the next decade the number of populations and tourists will be increased, therefore, researcher would like to study the ratio of water supply and the impact of water will be affected to the tourism, to protect the incident it may occur, and implement the strategic plan to solve the problems in advance.

4.1 The results of this paper showed that, at the present day, there are 1) about 3,000,000 tourists with the revenue of 6,000 million Baht, 2) There are a variety and diversity of tourist attractions, 3) There are 23 big and standardized hotels, 4) There are more than 120 tour operators, 5) There are a variety of modes of transports: air, rail, and roads, 6) There are variety and diversity of tourist attractions in all 5 provinces.

In the next decade, not only the number of populations, but also the number of excursionists, tourists, and visitors, along with revenues will grow gradually and will not affect the amount of water supply.



**Figure 1** The prediction of numbers of Thai and foreign excursionist, tourists, and visitors in the next decade



**Figure 2** The prediction of revenues from tourism in the next decade

The stake-holders can be divided into 2 main groups (government organizations and private organizations and local people) which can be divided into 12 groups: 1) government organizations 2) private organizations and local people. Twelve key informants were: 1) people who lived in the area, 2) government organizations in the area, 3) interested academics and academic institutions, 4) workers' representative who might be affected positively and negatively, 5) chiefs of the people or influencers, 6) local politicians, 7) NGO agents and social volunteers related to ONWR, 8) NPO in the area, 9) private sectors and entrepreneurs, 10) those who took part in planning and budgeting, 11) plan owners, and 12) the highest chiefs of government offices or the full authorize representative with decision making power. (NESDC, 2020)

The data collected from government organizations for the first focus group shown in Table 8.

**Table 8** First focus group of government organizations result

No.	Date/Time	Place	Attendants	Results
1	September 27, 2021 08.30-16.00	Chaiyapruk Room, Loei Palace Hotel, Loei	52	- Supply and allocate water resource fairly and effectively - Protect and improve ecological service linked to water resource - Support the adaptation to the problems of water resource and the climate change - Strengthen and support the river basin administration and management
2	September 28, 2021 08.30-16.00	Chaiyapruk Room, Loei Palace Hotel, Loei	63	- Supply and allocate water resource fairly and effectively - Protect and improve ecological service linked to water resource - Support the adaptation to the problems of water resource and the climate change - Strengthen and support the river basin administration and management
3	September 29, 2021 08.30-16.00	Monthathip Hall Convention and Exhibition Center, Udonthani	76	- Supply and allocate water resource fairly and effectively - Protect and improve ecological service linked to water resource - Support the adaptation to the problems of water resource and the climate change





No.	Date/Time	Place	Attendants	Results
4	September 30, 2021 08.30-16.00	Monthathip Hall Convention and Exhibition Center, Udonthani	86	<ul style="list-style-type: none"> <li>- Strengthen and support the river basin administration and management</li> <li>- Supply and allocate water resource fairly and effectively</li> <li>- Protect and improve ecological service linked to water resource</li> <li>- Support the adaptation to the problems of water resource and the climate change</li> <li>- Strengthen and support the river basin administration and management</li> </ul>
5	October, 1, 2021 08.30-16.00	Grand Benchawan Room, Nongkhai Tha Villa Hotel, Nongkhai	82	<ul style="list-style-type: none"> <li>- Supply and allocate water resource fairly and effectively</li> <li>- Protect and improve ecological service linked to water resource</li> <li>- Support the adaptation to the problems of water resource and the climate change</li> <li>- Strengthen and support the river basin administration and management</li> </ul>

After the first focus group of government organizations, the second focus group of private organizations and local people had followed to acquire the results from the private organizations and local people. The result shown in Table 9.

**Table 9** Second focus group of private organizations and local people result

No.	Date/Time	Place	Attendants	Results
1	November 22, 2021 08.30-16.00	Sirintara 2 Room, The One Hotel, Buengkan	77	<ul style="list-style-type: none"> <li>- Create value of culture and customs related to water such as travel in rivers or canals, support conservative tourism, cultural creative tourism etc.</li> <li>- Conserve and preserve water resources</li> <li>- Continue and promote culture and customs in the area</li> </ul>
2	November 23, 2021 08.30-16.00	Pasakorn Room, Monthathip Convention and Exhibition Center, Udonthani	96	<ul style="list-style-type: none"> <li>- Create value of culture and customs related to water such as travel in rivers or canals, support conservative tourism, cultural creative tourism etc.</li> <li>- Prevent negative impacts such as flooding, landslide etc. that affected to the tourism</li> </ul>
3	November 24, 2021 08.30-16.00	Pasakorn Room, Monthathip Convention and Exhibition Center, Udonthani	91	<ul style="list-style-type: none"> <li>- Create value of culture and customs related to water such as travel in rivers or canals, support conservative tourism, cultural creative tourism, agro-tourism etc.</li> <li>- Promote agro-tourism in agricultural areas</li> </ul>
4	November 25, 2021 08.30-16.00	Chaiyapruk Room, Loei Palace Hotel, Loei	55	<ul style="list-style-type: none"> <li>- Create value of culture and customs related to water such as travel in rivers or canals, support conservative tourism, cultural creative tourism, agro-tourism etc.</li> <li>- Conserve and preserve water resources</li> <li>- Continue and promote culture and customs in the area</li> <li>- Promote agro-tourism in agricultural areas</li> </ul>
5	November 26, 2021 08.30-16.00	Chaiyapruk Room, Loei Palace Hotel, Loei	51	<ul style="list-style-type: none"> <li>- Create value of culture and custom related to water such as travel in rivers or canals, support conservative tourism, cultural creative tourism, agro-tourism etc.</li> <li>- Conserve and preserve water resources</li> <li>- Continue and promote culture and customs in the area</li> <li>- Promote agro-tourism in agricultural areas</li> </ul>





Finally, the researcher acquired all ideas from the focus groups discussions with all stake-holders and found that, 1) government should create the strategic plan of the usage of water in the area for the next decade, conserve and manage water resources along with the successful protection of the ecology in the area throughout the next decade, and support and strengthen water user organizations and agriculture and also support more water to the agriculture and supply the amount of water for consumers; 2) the private organizations and local people should work in collaboration with the government promote values of ways of lives and culture along with agro-tourism and religious tourism.

## 5. Conclusion

After acquiring data from interviewing with stake-holders and two focus groups discussion, the researcher found that:

5.1 The last 10 years and present situation of water supply and the impact of the water to the area and tourism was enough amount of water supply, however, there was flooding once impacted to the area and tourism.

5.2 There were many rivers, canals and water resources which were sufficient for supplying the area and tourism for the next decade.

5.3 The prediction of excursionists, tourists, and visitors for the next decade will increase gradually which will not impact on tourism, however, flooding may occur in the monsoon season.

5.4 The government should come up with a master or strategic plan for preserving water resources, and protecting the area from any disasters such as floods and landslide.

5.5 The private organizations and local people in the area should promote the value of culture and customs related to water such as travel in rivers or canals, support conservative tourism, cultural creative tourism, agro-tourism etc.

5.6 The private organizations and local people should preserve water resources, and promote culture and customs in the area to promote cultural and creative and agro-tourism.

The recommendations for further studies were:

1) The study of water resources should be conducted throughout the country by dividing into group of provinces to reserve water for the future.

2) Preserve and conserve the water resources sustainably.

3) Create the strategic plan to improve the protection of disaster occurred from water and control the usage of water for the future.

## 6. Acknowledgements

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