

Project Report # 1

PROJECT COMPLETION REPORT OF THE

# LAO URBAN FIRE RISK ASSESSMENT MAPPING IN VIENTIANE CAPITAL

ການສ້າງແຜນທີ່ປະເມີນຄວາມສ່ຽງໄພຢູ່ນະຄອນຫລວງວຽງຈັນ

LAO URBAN DISASTER MITIGATION PROJECT

ໂຄງການຜ່ອນຕາຍໄພພິບັດຢູ່ໃນຕົວເມືອງຢູ່ລາວ

PREPARED BY URBAN RESEARCH INSTITUTE

ໂດຍສະຖາບັນຄົ້ນຄວ້າຜັງເມືອງ

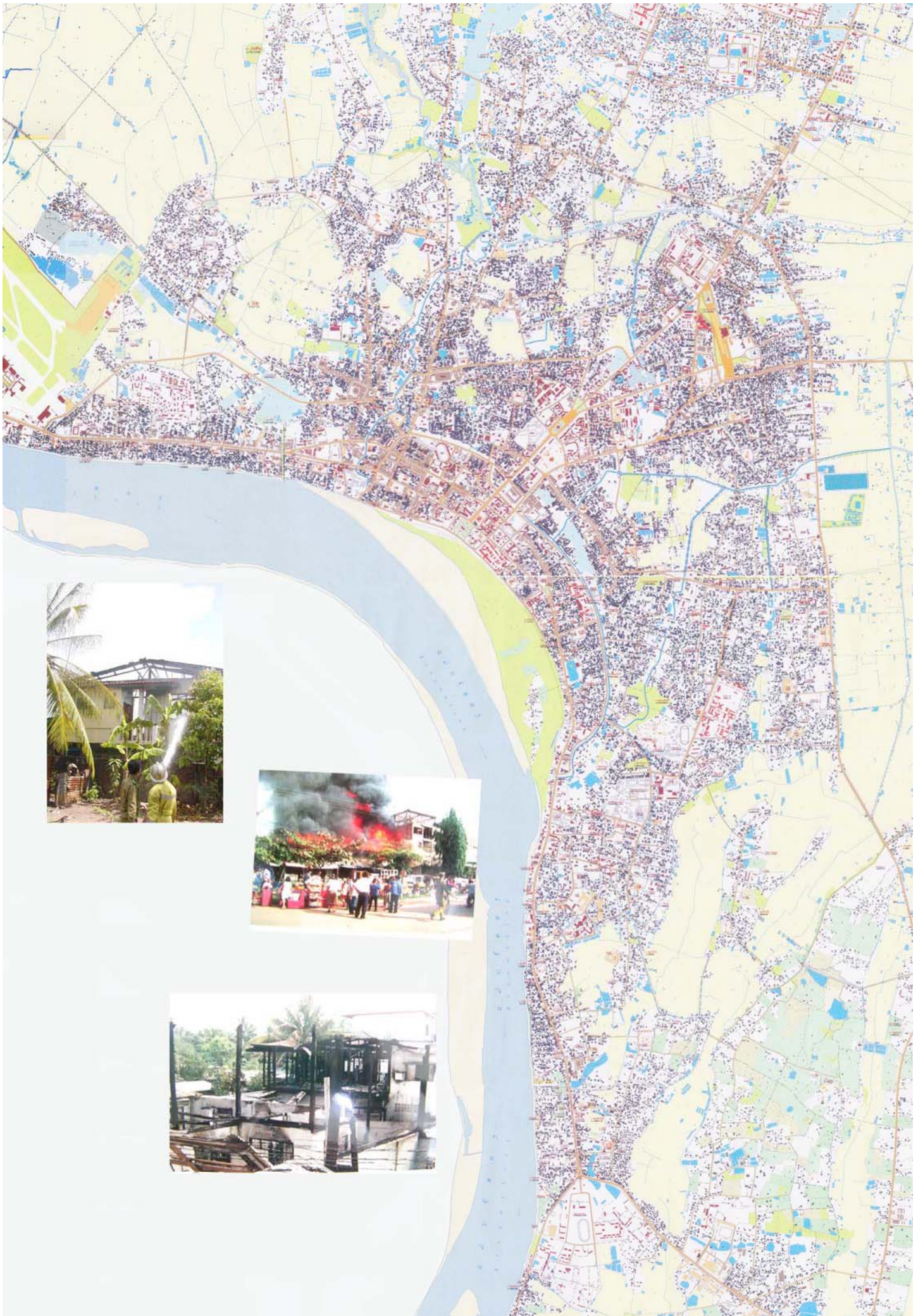
DECEMBER 2004



UNDER THE

ASIAN URBAN DISASTER MITIGATION PROGRAM





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#### LEGEND



Very High



High



Moderate



Low



District Boundary



Road



Fire Station



Hospital



NDMO



URI

District	Number of village				Total
	Very High	High	Moderate	Low	
Chanthabury	8	9	6	1	24
Xaysettha	9	5	1	0	15
Sikhottabong	19	4	0	0	23
Sisattanak	20	8	1	0	38
				1	100

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No.	Sisattanak District	Sikhottabong District	Xaysettha District	Chanthabuly District
1	Phixwat	Khouanta Na	Phonvath	Hotsady Tal
2	Thakha	Nakhom	Songtho	Thongkhom Neua
3	Phapho	Nakhom	Sophonmor	Thongkhom Neua
4	Phaxoi	Nakhom	Sophonmor	Thongkhom Neua
5	Bungkhansong Tal	Nanguan Tal	Tholuang Neua	Sikomkhuane
6	Bungkhansong Tal	Nanguan Tal	Tholuang Neua	Sikomkhuane
7	Fai	Nongpanoy	Tholuang Tal	Dangnieng
8	Nangahant	Wattayay Tha	Hong ka	Sihom
9	Dangpalane Tha	Wattayay Thong	Phonthan Neua	
10	Dangpalane Thong	Wattayay Thong		
11	Phonvath	Wattayay Thong		
12	Phonvath Tal	Akad		
13	Phonvath			
14	Sophonthong Tal	Silay Thong Tal		
15	Sophonthong Tal	Silay Thong Tal		
16	Thongphom			
17	Sokpaluang	Onzaba		
18	Phonpao Thong	Sophonthong Thong		
19	Thaphalane			
20	Phonvath			
21	Watab			
22	Phaxoy			
23	Souanemone			
24	Hayok			
25	Chomchong			
26	Khokhith			
27	Sayathane			
28	Chomphet Neua			
29	Chomphet Tal			



#### LAO PDR URBAN DISASTER MITIGATION PROJECT



National Disaster Mitigation Office



Urban Research Institute



Asian Disaster Preparedness Center

VIENTIANE FIRE RISK MAP

FIRE RISK ZONE : ADMINISTRATIVE LEVEL

MAP NO. 10

Lao Urban Disaster Mitigation Project (LUDMP) was done in 2002 – 2004 target of project were Urban Disaster Mitigation, as Fire Risk Assessment Mapping, Training, Information and Media, the most activities were implemented by related organization's National Disaster Mitigation Office, Urban research Institute and Fire prevention and protection Police, which project were Implemented in Vientiane Capital, Pakse City and Luangprabang City

Asian Urban Disaster Mitigation Program (AUDMP), launched in 1995 is the largest regional of ADPC. The program, with core funding from the office of foreign Disaster Assistant of the United States Agency for international Development, will ultimately work in ten or more countries of the region. The program was designed to make cities safer from disasters. The goal of the AUDMP is the reduce the disaster vulnerability of urban populations, infrastructure, critical facilities and shelter in target cities in Asia, and to promote republication and adaptation of successful Mitigation measures throughout the region. Towards this end, the program Develops and support national demonstration projects, information Dissemination and networking activities, and policy seminars and professional training in the target countries of the Bangladesh, Cambodia, India, Lao PDR, Nepal, Philippines, Sri Lanka, Thailand and Vietnam

The Asian Disaster Preparedness Center (ADPC) is a regional resource Center dedicated to disaster reduction for safer communities and sustainable development in Asia and the Pacific. Established in 1986 in Bangkok, Thailand, ADPC is recognized as an important focal point for promoting disaster awareness and developing capabilities to safer institutionalized disaster ,management and mitigation policy. For more information, please get in touch us with us at the following address ;

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## **Acknowledgement**

Urban Research Institute would express her sincere thanks and deeply appreciate to all partners for assisting on Fire Risk Assessment Mapping of Vientiane Capital especially namely Asian Disaster Preparedness Center for financial and expertise for mapping, Mr. N.S.M Arambepola AUDMP Team Leader for inspecting and contributed expertise to the project, Mr. Phetsavang Sounnalath Director General of NDMO and colleagues for coordinating with project owner as ADPC, Mr. Chira Prangkio Consultant from Siangmai University, Thailand. Mr. Surisack Simmanotai from Department Fire Prevention and Protection Police of Ministry of public Security for contributing information on fire disaster environmental in Vientiane Capital, 100 head villagers for accurate villages borders.

At last, we would like to express our deeply sincere thanks and high appreciate to Vientiane people and local authorities for providing helpful information and assist to successful of this Fire Risk Mapping. We do hope that this document will be basic information to help you on urban fire management work and it would replicable to other towns.

With the Best Regards

Keophilavanh Aphaylath  
Director General

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## Introduction

Lao Urban Disaster Mitigation Project is a first project that with financial support from ADPC. There are three main organizations involve as 1./ National Disaster Management Office of Ministry of Labor and Social Welfare, 2./ Urban Research Institute, Ministry of Communication Transport Post and Construction ( MCTPC), 3./ Police Fire Prevention and Protection Department, Ministry of Public Security. Project's activities are including 3 main parts as: Risk Assessment, Training and Public Awareness. The implementing area was selected of main urban area and high density or fire risk areas, this pilot project implementation was in Vientiane Capital, Champasak and Luang Prabang provinces. The first places was in Vientiane Capital, following with Champasak and lastly at Luang Pra Bang.

Vietiane capital is located at the Center of Lao, this city is gathering Authority and economic of Lao PDR. Since 1975 until now, the economic was growth which effected to increasing inside the city of residence. The building construction and some built areas is not followed land use plan, some place was not access in inside and connected to the main road. Material as wood which very risky to fire. Other activities in towns are also risk for fire as Gas shop, Gasoline station and cooking, Candle light for praying and not aware of fire disaster. In the past, there are 240 fires during 1990-2000 in Vientiane Capital; its damaged cost was over 2 million USD.

There are three main organizations involved to risk assessment mapping as 1./ Department of Labor and Social Welfare Luang Prabang, 2./ Urban Research Institute, Ministry of Communication Transport Post and Construction ( MCTPC), 3./ Police Fire Prevention and Protection Unit Luang Prabang. It was three months and 4 steps for this mapping as: Step 1./ defined of criteria for fire risk and developed data collection form, Step 2./ collecting data from various organization and Field survey by walking through villages, Step 3./ Analysis data from field and Step 4./ apply data into map procedure to find the fire risk zone and reporting books. These whole set document will be basic information for urban fire risk assessment, It will hand over to 8 organizations involved as following:

1./ Department of Fire Prevention and Protection Police. 2./ Department of Labor and Social Welfare Vientiane capital. 3./ Vientiane Urban Development Administration Authority, 4./ Department of Communication Transport Post and Construction Vientiane Capital. 5./ Sisattanak District Office, 6./ Xaysettha District Office, 7./ Chathabury District Office, 8./ Sikhottabong District Office

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## Abstract

In case of Lao PDR the urbanization trends seems to be slower than in the other countries therefore provide great opportunities for introducing new tools for reducing the ill effects of urbanization. Reduction of the disaster impacts in urban areas is seen as one of the priorities faced by city governments. For instance the fires and traffic accidents in the urban area of Vientiane have caused more damage than any natural hazards in the recent past .It became a priority issue for the city government which needs immediate attention. At the pre design stage of the AUDMP project in Lao PDR, a joint USAID ADPC assessment of potential hazards in the capital city identified a critical shortage of fire fighting capacity as well as the general field of emergency services. In addition, the expansion of the city's built environment and infrastructure provides new opportunities for promoting culture of safety through safer building construction initiatives. No organization is currently addressing the institutional capacity needs of the Fire Brigade nor is the government taking a comprehensive approach toward the development of policies, practices and institutional collaboration in the area of urban emergency services. AUDMP project in Lao PDR takes initiatives to establish scientific practices for risk assessment, action planning aimed at introduction of appropriate measurers and capacity building. This paper deals with the methodology adapted in developing fire hazard maps in Vientiane

## 1. General

The Lao PDR <sup>1</sup> is a land locked country which borders with China to the North, Cambodia to the South, Vietnam to the East , Thailand to the West and Myanmar to the North - West. The country is divided into 16 provinces and one capital city (Vientiane). Lao PDR has total area of 236,000 square kilometers with a population of 5.3 million with 80% in rural areas and 20% in urban areas. The current annual population's growth rate is 2.8%, the highest in ASEAN countries. Based on current trends the urban population of Laos will double in the next 25 years. This rapid population growth is already straining infrastructure and the pressure to develop housing, roads, commercial facilities, and other infrastructure facilities. If unplanned and unmanaged, this rapid urban growth will greatly increase the vulnerability of Lao PDR's major population and economic centres. While floods have the greatest impact on the country's population as a whole, in urban areas fires and traffic accidents have the greatest impact in terms of lives lost, injuries, and economic loss. It is an accepted fact that the increasing urbanization in the context of Lao PDR, presents major challenges and opportunities for experimenting scientific approaches for reduction of impact of disasters in the future.



The People's Democratic Republic of Laos (Lao PDR) often faces a range of disaster events including flood, drought, landslides, as well as unexploded ordinance, fires and other events of manmade nature. A large percentage of the population exists on subsistence agriculture or limited cash crops reliant on seasonal rains, and is extremely vulnerable to variations in rainfall and flood levels. Lack of infrastructure and limited



opportunities for planning add to the country's development challenges. The average annual income per person is approximately US\$ 330, with rice farming still being the main income generating activity. 53 percent of the GDP comes from agricultural sources and 80% of the households depend on agriculture for their livelihood. In recent years tourism and the sale of electricity have become an important source of revenue for the country<sup>2</sup>. In 2000 the GDP grew 5.7 % and it is expected that by 2005 the growth rate will reach 7 %. Lao PDR is one the poorest and least developed countries in ASEAN. According to the UNDP's Human Development Report for 2002, Lao PDR ranks as number 143 out of 173 countries in the human development index. Almost 40 % of the Lao population lives below the poverty line.

## 2. Background

The Government's new economic policies, promoting economic development by facilitating private sector investment, have resulted in unprecedented growth in construction sector. Country is experiencing a construction boom, particularly with respect to roads and larger modern buildings. The top five areas of foreign investment are transport communications, industry and handicrafts, electricity, hotels and tourism, and the timber industry.

This immense growth in infrastructure, in terms of buildings and roads, presents both challenges and opportunities. For example, the series of road construction loans made by ADB is changing the face of Vientiane and probably is fueling other projects such as the ADB funded Vientiane Integrated Urban Development Project and the Advanced Urban Planning & Management courses. Yet the country is unprepared for the consequences of all the development activities underway.

Dense building concentrations, narrow roads, flammable building materials, aging water and electrical supply systems, and lack of resources to upgrade preparedness and response have resulted in a growing risk of large scale, multiple structure fires. For example, two recent fires in Vientiane Province destroyed 190 and 300 buildings, respectively. The tremendous increase in motorized vehicles in cities and towns comfortable with pedestrians and bicycles has introduced a long list of safety and rescue issues not yet dealt with in the numerous road development projects in progress.

## 3. The Lao PDR Urban Disaster Mitigation Project

The Lao PDR Urban Disaster Mitigation Project focuses on incorporating risk management and hazard mitigation into development planning of urban areas, with the city of Vientiane as the pilot. Under the direction of the National Disaster Management Office, and with the technical support of the Urban Research Institute and ADPC, the Phase I of the project centers on a multi-hazard risk assessment of the city, with primary focus on urban fire. The risk assessment will include both a city-level activity and a pilot community hazard assessment. The Vientiane Disaster Management Committee will advise and guide the risk assessment process, as well as the development of an action plan at the end of the first phase.

Mitigation activities, implemented by the NDMO, will commence in Phase II and will focus on specific mitigation initiatives and activities such as public awareness and

social marketing, training, and information dissemination activities. Anticipated mitigation initiatives include: development of appropriate mechanisms to guarantee fire safety, development of improved guidelines for fire loss reduction in development planning; capacity building for the fire brigade, in partnership with the Melbourne Fire and Emergency Services Board; training of town planners in urban disaster mitigation; and pilot community-based activities for loss reduction.

#### **4. Vientiane fire risk assessment**

##### **4.1 issues connected with the high rate of incidences of urban fire and impacts.**

Sited on a relatively flat plain in a bend of the Mekong River, Vientiane is the largest city in the country with an urban population estimated at 133,000; the population of the entire prefecture is around 528,000 people. As the center of both national and municipal government administration, Vientiane has numerous government office buildings and a growing number of hotels and service industries. Lack of appropriate mechanisms to guarantee the fire safety in new development is one of the propriety issues This include building approval process, provision of additional fire fighting facilities, skilled man power, capacity building programs etc.

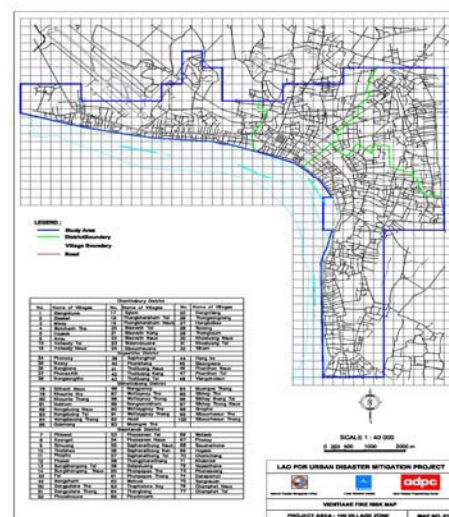
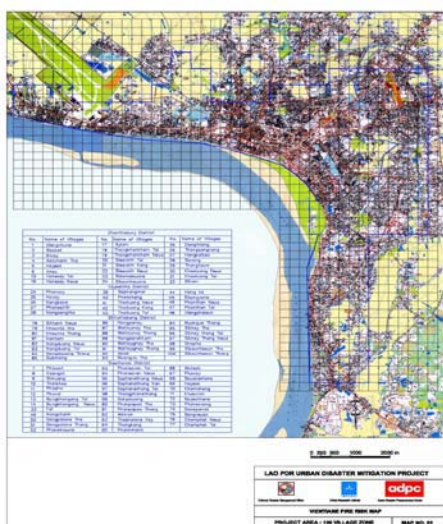
Construction of new roads, expansion of existing roads, provision of other in fracture facilities etc are considered to be essential features of the rapid urban development which is underway in the city of Vientiane But unfortunately to date, rehabilitation of the old water pipes under the roads has not been included in the road improvement projects, and the fire hydrants are not being replaced as the road surfacing is completed. Lack of access to hydrants contributes to the increasing vulnerability to urban fires and is only one of the more visible constraints to the development of a more modern fire fighting capability.

As the capital city, Vientiane is home to both the National Fire–Service (1 station) and the Vientiane Municipal Fire Brigade (1 station). There is a third station at the airport, which is dedicated to airport service. While the Fire Brigade received new fire trucks from JICA 10 years ago, there are serious deficits in terms of specialized equipment, spare parts, communications, etc. The Fire Brigade has defined several areas where assistance is needed: 1) equipment to train and upgrade (rescue equipment, investigation materials, awareness materials, etc.); 2) outreach to civil servants, private sector; 3) legal framework to extend their mission, develop their technical capability; 4) skills upgrading.

Other options for upgrading or initiating new activities, such as: establishing an improved alert system to notify firefighters of an emergency call; posting an updated area map showing landmarks, turnout areas, hydrants/water sources, high hazard areas, etc.; upgrading equipment maintenance and procurement; improving the number and condition of uniforms/turnout gear; obtaining rescue equipment for fires and road accidents; obtaining breathing apparatus for firefighters; improving the information collection/analysis capability, including initiating documentation of response times in order to facilitate self assessment; assessing the overall communications system in order to improve command and control and site to station links.

## 4.2 Study area

The study area covers 100 villages in the urban area of Vientiane Municipality, which plays the most important role in the political and economic activities. The study area is about 2977 ha, comprises some part of 4 administrative districts, Chantabouly, Sikhotabong, Sisatanak and Xaysetta. The study area show in Figure 1, and Name and Number show in Table: 01, 02



**Table: 01 Number of Villages**

District		Number of village in study area	Number of village in District
1	Chanthabury	24	37
2	Xaysettha	15	50
3	Sikhottabong	23	59
4	Sisattanak	38	40
Total		100	188

**Table: 02 Name of Villages**

No.	Chanthabury District	Xaysettha District
	Name of villages	Name of Villages
1	Xiengnhune	Phonxay
2	Sisaket	Naxay
3	Mixay	Nongbone
4	Watchanh Tha	PhonsaAth
5	Haysok	Nongsangtho
6	Anou	Saphangmor
7	Hatsady Tai	Phonkheng
8	Hatsady Neua	Thatluang Neua
9	Sylom	Thatluang Kang
10	Thongkhankham Tai	Thaluang Tai
11	Thongkhankam Neua	Hong Ke
12	Sisavath Tai	Sisangvone
13	Sisavath Kang	Phonthan Neua
14	Sisavath Neua	Phonthan Tai

15	Sidamdouane	Viengchaleun
16	Sibounheuane	
17	Dongmieng	
18	Thongsangnang	
19	Hongkaikeo	
20	Savang	
21	Thongtoun	
22	Khoaluang Neua	
23	Khoalung Tai	
24	Sihom	
<b>Sisattanak District</b>		<b>Sikhottabong District</b>
1	Phiawat	Sithanh Neua
2	Kaongot	Khounta Tha
3	Simuang	Khount Thong
4	Thatkhao	Nakham
5	Phapho	Nongduang Neua
6	Phaxai	Nongduang Tai
7	Bungkhongong Tai	Nongduang Thong
8	Bungkhongong Neua	Oubmong
9	Fai	Nongpanay
10	Nongchanh	Wattaynoy Tha
11	Dongpalane Tha	Wattaynoy Thong
12	DongPhane Thong	Nongsanokham
13	Phonsinoune	Wattaynay Tha
14	Phonsavan Tai	Wattayay Thong
15	Phonsavan Neua	Akad
16	Saphanethong Neua	Muongva Tha
17	Saphanethong Kan	Muongva Thong
18	Saphanethong Tai	Sikhay Tha
19	ThongPhanethong	Sikhay Thong Tai
20	Sokpaluang	Sikhay Thong Neua
21	Phonpapao Tha	Gnapha
22	Phonpapao Thong	Sibounheaun Tha
23	Watnak	Sibounheaun Thong
24	Thaphalanexay	
25	Thongkang	
26	Phanhmanh	
27	Watsob	
28	Phoxay	
29	Souanemone	
30	Haysok	
31	Chomcheng	
32	Khokninh	
33	Saysathane	
34	Phonsavang	
35	Donepamai	
36	Sangveuan	
37	Chomphet Neua	
38	Chomphet Tai	

## 5. The criteria for assessment of fire hazard ratings.

The fire risk zone mapping is decided to be carried out in few stages. The first is to define the map units that can delineate the component of attributes to potential fire hazard. The research studies taken place in similar environment elsewhere and local knowledge helped the project to examine the factors attributing to fire hazard in the context of Vientiane. In considering the suitability of a particular area for residential or other forms of development in the urban surroundings of the Vientiane city, the potential fire hazard ratings have been assessed in relation to the following criteria or factors; The mapping has been done using a 1:10,000 base map (land use and infrastructure map) of Vientiane obtained from the National Geographic Department. The map has been divided into grid of 250m x250m (figure 2). There are 1230 grids in total and divided in to 7 survey teams of 3 persons.

**Table: 03 Criteria for assessment of fire risk ratings**

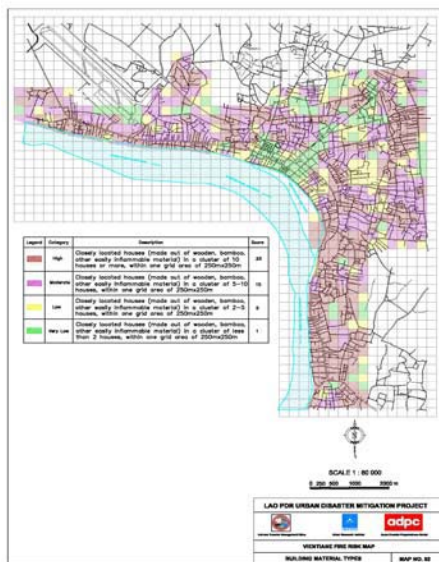
Map unit		Total score
1	Building material type	25
2	Availability of fire sources	15
3	Fire fighting scenario	15
4	Electrical wiring	5
5	Fire history	10
6	Building Density	15
7	Accessibility	15
Total		100

### 5.1 Building material type;

The hazard depends on the quantity of inflammable material, which is a major contributor to the intensity of fire. The contributory factor can be easily evaluated through examination of building typologies, construction material and closeness of location to each other in terms of its effect on initiation of a potential fire .It also relate to the probability of fires being started due to the activities taking place within the location. Those reasons can be can be recreational, negligence, mistakes etc.

**Table 4: Building material type rating**

Category	Description	Score (Maximum 25)
High	Closely located houses (made out of wooden, bamboo, other easily inflammable material) in a cluster of 10 houses or more, Within one grid area of 250 m x 250m	25
Moderate	Closely located houses (made out of wooden, bamboo, other easily inflammable material) in a cluster of 5-10 houses, Within one grid area of 250 m x 250m	15
Low	Closely located houses (made out of wooden, bamboo, other easily inflammable material) in a cluster of 2-5 houses, Within one grid area of 250 m x 250m	5
Very low	Closely located houses (made out of wooden, bamboo, other easily inflammable material) in a cluster of less than 2 houses, Within one grid area of 250 m x 250m	1

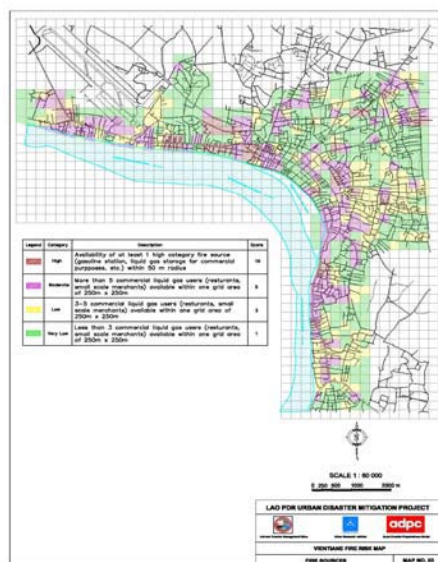


### 5.2 Fire sources

The hazard depends on the quantity of available fuel, which is a major contributory factor.

Table 5: Fire sources rating

Category	Description	Score (Maximum 15)
High	Availability of at least 01 high category fire source (gasoline station, liquid gas storage for commercial purposes, etc.) within 50 m radius	15
Moderate	More than 5 commercial liquid gas users (restaurants, small scale merchants) available Within one grid area of 250 m x 250m	5
Low	3-5 commercial liquid gas users (restaurants, small scale merchants) available Within one grid area of 250 m x 250m	3
Very low	Less than 3 commercial liquid gas users (restaurants, small scale merchants) available Within one grid area of 250 m x 250m	1

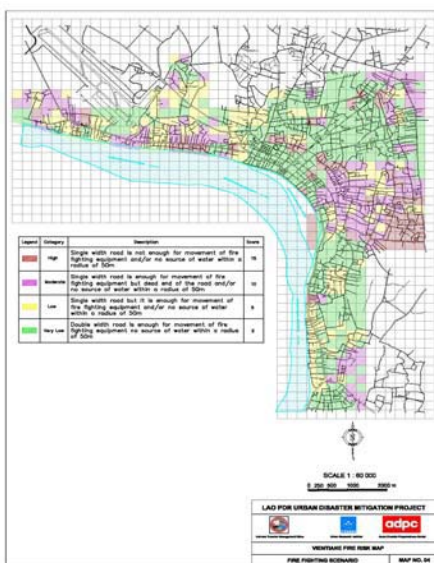


### 5.3 Fire fighting scenario

The capability or the effectiveness of fire fighting services within a given location can be determined by the availability of water and available maneuvering space to mobilize the fire fighting team within a fastest time possible to act in an appropriate manner in case of fire.

Table 6: Fire fighting scenario rating

Category	Description	Score (Maximum 15)
High	Single width road is not enough for movement of fire fighting equipment and/or no source of water within a radius of 50m.	15
Moderate	Single width road is enough for movement of fire fighting equipment but dead end of the road and/or no source of water within a radius of 50m.	10
Low	Single width road but it is enough for movement of fire fighting equipment and/or no source of water within a radius of 50m.	5
Very low	Double width road is enough for movement of fire fighting equipment but no source of water within a radius of 50m.	2



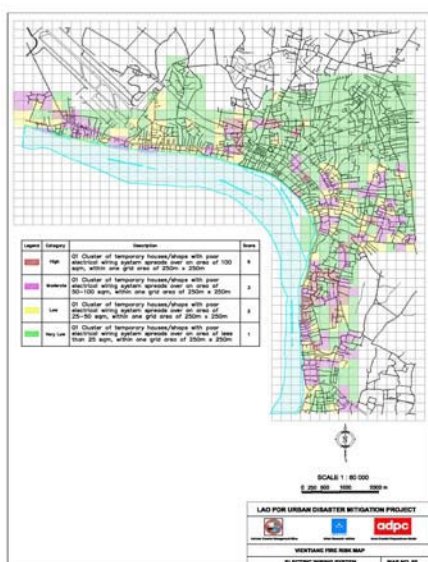
### 5.4 Electrical wiring system

In Vientiane city it has been observed that many connections are of temporary nature or due to maintenance of poor standards of wiring. This kind of irregularities can be observed mainly in market areas, open air shopping areas, in areas where underserved communities are located. Some times these are isolated pockets or series of pockets located in close proximity

Table 7: Electrical wiring system rating

Category	Description	Score (Maximum 5)
High	01 Cluster of temporary houses/shops with poor electrical wiring system spreads over an area of 100 sqm, Within one grid area of 250 m x 250m	5
Moderate	01 Cluster of temporary houses/shops with poor electrical wiring system spreads over an area of 50-100 sqm, Within one grid area of 250 m x 250m	3
Low	01 Cluster of temporary houses/shops with poor electrical wiring system spreads over an area of 25-50 sqm, Within one grid area of 250 m x 250m	2
Very low	01 Cluster of temporary houses/shops with poor electrical wiring system spreads over an area of less than 25 sqm, Within one grid area of 250 m x 250m	1

(Note; In case If there are more than one potential hazard area, total hazard rating will be the cumulative score as per the total calculated area for the grid area of 250 m x 250m)



### 5.5 Fire history of the area.

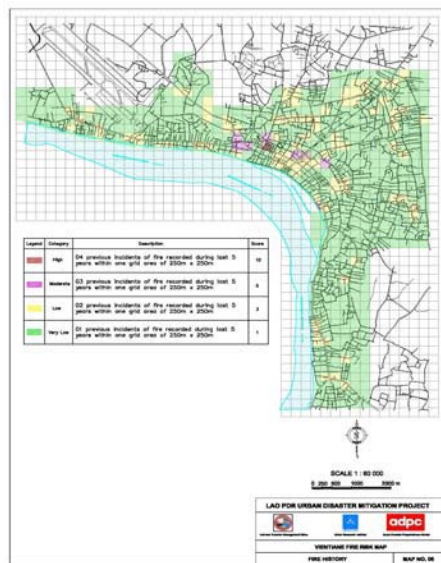
The history refers to the number of fires initiated within an area in the past. Areas, which are known to have been particularly prone to outbreaks of fire due to natural or manmade causes, have been considered in mapping as having high degree of Fire hazard.

Table 8: Fire history rating

Category	Description	Score (Maximum 10)
High	04 previous incidents of fire recorded during last 05 years Within one grid area of 250 m x 250m	10
Moderate	03 previous incidents of fire recorded during last 05 years Within one grid area of 250 m x 250m	5



Low	02 previous incidents of fire recorded during last 05 years Within one grid area of 250 m x 250m	3
Very low	01 previous incidents of fire recorded during last 05 years Within one grid area of 250 m x 250m	1

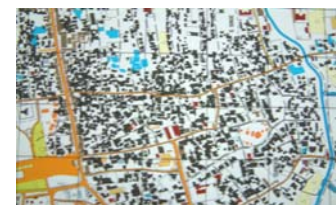
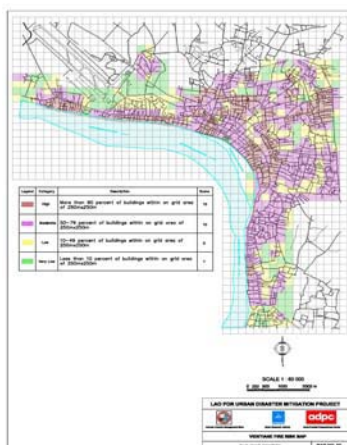


### 5.6 Building density

The fire hazard also depends on the density building. The contributory can be evaluated from the city map scale: 1: 5000 which is done by National Geographic Department. The Vientiane city map shows the location and size of buildings which is based on 1999 arial photographic data.

Table 9: Building densities

Category	Description	Score (Maximum 15)
High	More than 80 percent of buildings within on grid area of 250m x 250m	15
Moderate	50 - 79 percent of buildings within on grid area of 250mx250m	10
Low	10 - 49 percent of buildings within on grid area of 250mx250m	5
Very low	Less than 10 percent of buildings within on grid area of 250mx250m	1

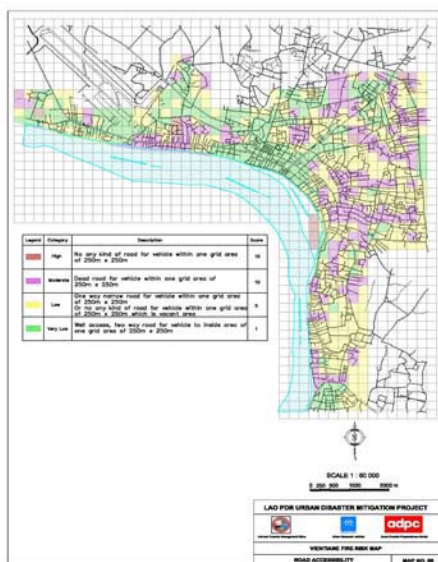


### 5.7 Accessibility of the area

Accessibility of the area relates to the capability or the effectiveness of fire fighting services. Accessibility can be evaluated from the 1:5000 city map which is good detailed.

Table 10: Road accessibility rating

Category	Description	Score (Maximum 15)
High	No any kind of road for vehicle within one grid area of 250mx250m	15
Moderate	Dead road for vehicle within one grid area of 250mx250m	10
Low	One way narrow road for vehicle within one grid area of 250mx250m, which is vacant area. Or no any kind of road for vehicle within one grid area of 250mx250m which is vacant area.	5
Very low	Well access, two way road for vehicle to inside area of one grid area of 250mx250m	1

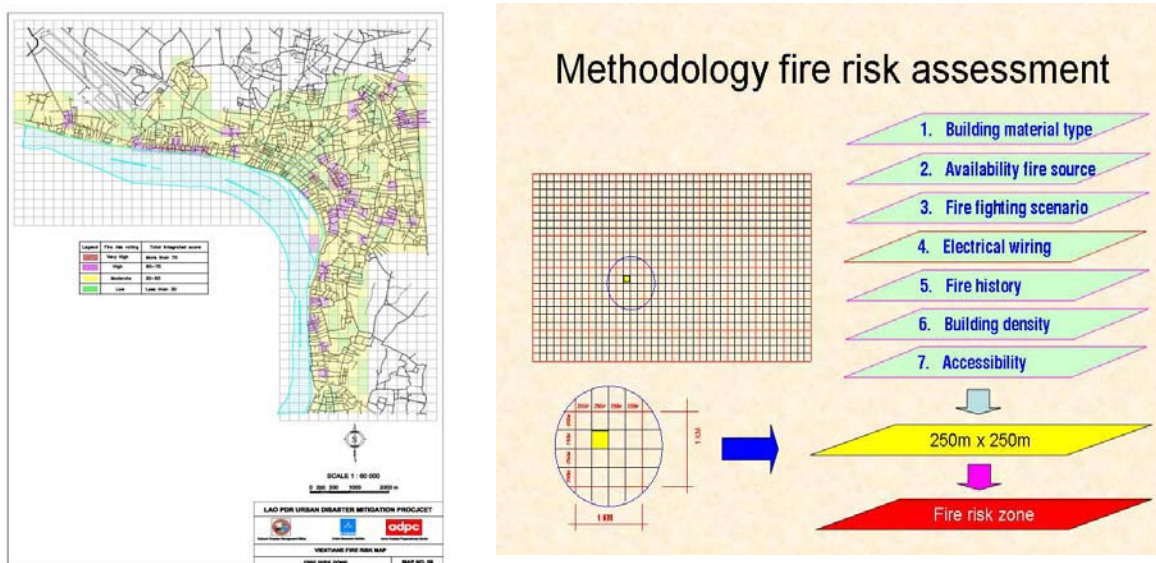


### 6. Fire hazard Zonation.

The fire hazard map will be prepared through integration of individual attributes through overlay process. Since URI does not possess the GIS capacity integration will be done through manual method. The zonation will be done through identification of areas having relatively uniform characteristics from the fire hazard attribute viewpoints through clustering according to the total fire hazard rating.

Total fire hazard rating.

Total integrated score	Fire hazard rating
More than 50	Very high
30-50	High
15-30	Moderate
5-15	Low
Less than 5	Very low



## 7. Result

Form the study result, the main factor of fire high risk is building materials which cover by 45.1% of total study area or 1343 ha (see the detail in table 12 and Map02) The second factor of high is building density is cover by 16.6%. The other factor is lower 10% such as fire history is cover only 0.6%. In the five years period, the area had fire accident more than 4 times is 2 places, and less than 3 times is 4 places as show in Map 06.

When the hold information was compiled and analyses, we can summarized as; the very high risk area is about 47 ha or 1.58% of total study area which cover Nong Panay, KahoutaTha, Kao yot, Dongpalane Than and That Luang area. (as show in the Map 10)

Vientiane fire risk assessment is assessed by village boundary and form the study result show that 4 villages very high. (2 villages in Sikhottabong District and 2 in Sisatanak District) 14 villages is high risk and 69 villages is moderate risk and 13 villages in Low risk. (see table 13, 14 and Figure 05)

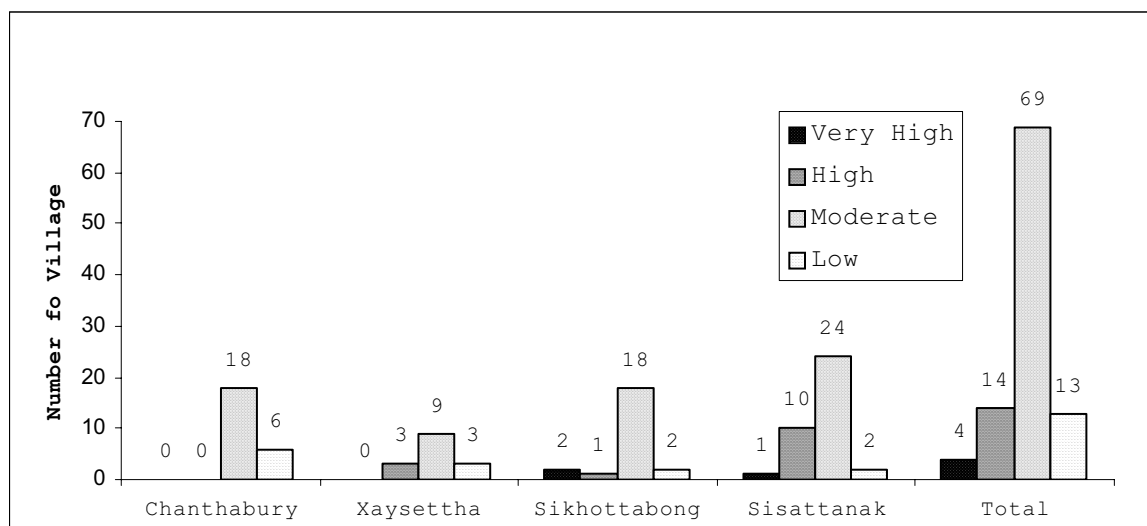
**Table 12: Total fire risk rating**

Fire risk attribute		Category			
		High	Moderate	Low	Very Low
Building material type	Area (Ha)	1,343	783	450	402
	Percentage (%)	45.1	26.3	15.1	13.5
Fire sources	Area (Ha)	199	634	712	1,432
	Percentage (%)	6.7	21.3	23.9	48.1
Fire fighting scenario	Area (Ha)	295	646	712	1,325
	Percentage (%)	9.9	21.7	23.9	44.5
Electric wiring system	Area (Ha)	167	453	515	1861
	Percentage (%)	5.6	15.1	17.2	62.1

Fire history	Area (Ha)	18	33	485	2,441
	Percentage (%)	0.6	1.1	16.3	82
Building density	Area (Ha)	494	1,224	786	473
	Percentage (%)	16.6	41.1	26.4	15.9
Road Accessibility	Area (Ha)	51	750	1,352	825
	Percentage (%)	1.7	25.2	45.4	27.7

**Table 13: Number of village fire risk rating**

District	Number of village				Total
	Very high	High	Moderate	Low	
Chanthabury	0	0	18	6	24
Xaysettha	0	3	9	3	15
Sikhottabong	2	1	24	2	23
Sisattanak	1	10	69	2	38
Total	4	14	1811	13	100
Area (ha)	47	358	60.83	761	2977
Percentage (%)	1.58	12.03		25.56	100



## 8. Lessons learned

1. Fire hazard zonation mapping is a new area and useful tool for delineating the vulnerability, which can be used in subsequent development planning activities of the city. But It's a time consuming and costly as external technical assistance is essential not only in defining the map units and ratings but also in training the survey teams, data recording, integration of attributes etc.
2. There can be difficulties in replication of the activity in to other areas as the base maps of the required detail ness may not be available.
3. It is useful to include volunteers selected from the area in field survey. They can be a source of information from one hand and on the other hand it is easy to obtain the cooperation of local community.
4. Project adopted an approach to include members from many stakeholders

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Institutions possible in survey teams. Indirectly it became an opportunity for creation of awareness.

## 9. References

- 1 Project Proposal- The Lao PDR Urban Disaster Mitigation Project, AUDMP document, 2002, June
- 2 Guideline paper on Urban Fire Hazard mapping, URI, 2002, July.
- 3 Fire Hazard mapping, a joint project by the ministry for planning and environment and the country of fire authority, Victoria, Australia.
- 4 New technology to reduce fire losses and costs, Grayson.S.J, Smith.D.A, Elsevier, 1986.

## 10. Maps

- 1 Existing Area
- 2 Boundary of Project area
- 3 Building material type
- 4 Fire sources
- 5 Fire fighting scenario
- 6 Electrical wiring system
- 7 Fire history
- 8 Building density
- 9 Accessibility of the area
- 10 Fire risk zonation

1 Existing Area



0 250 500 1000 2000 m

LAO PDR URBAN DISASTER MITIGATION PROJECT



National Disaster Management Office



Urban Research Institute



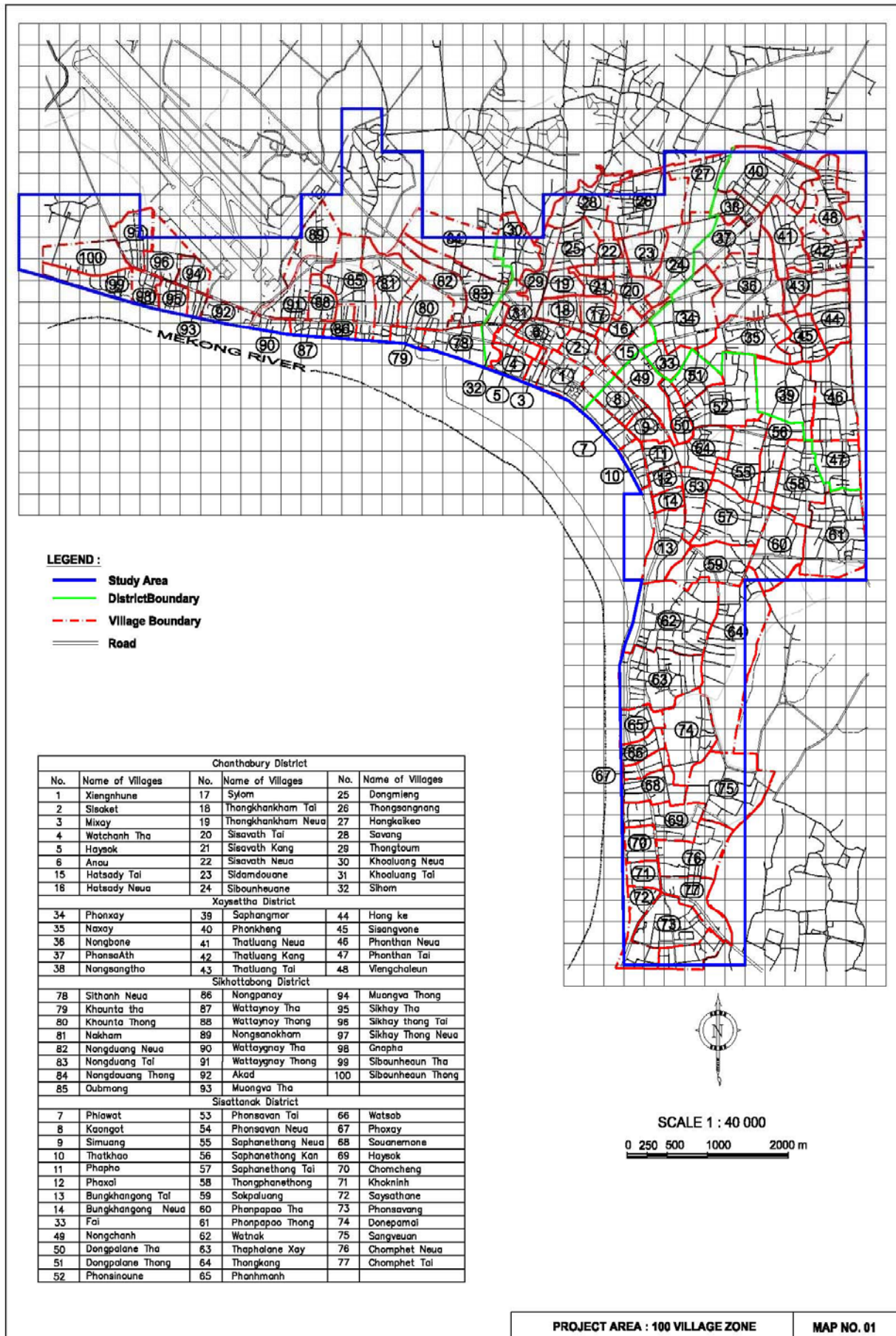
Asian Disaster Preparedness Center

VIENTIANE FIRE RISK MAP

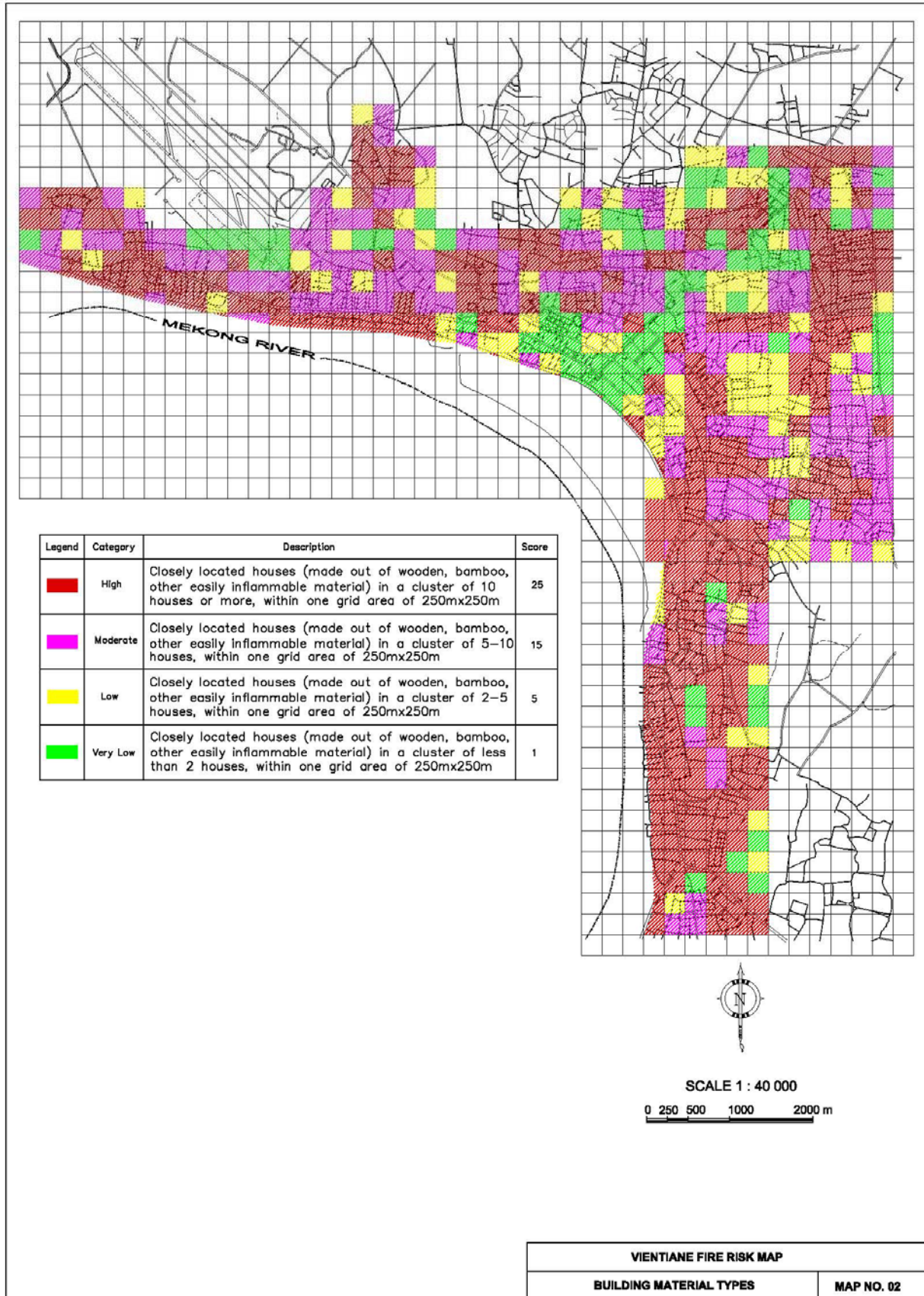
CURRENT AREA

MAP NO. 00

2 Boundary of Project area

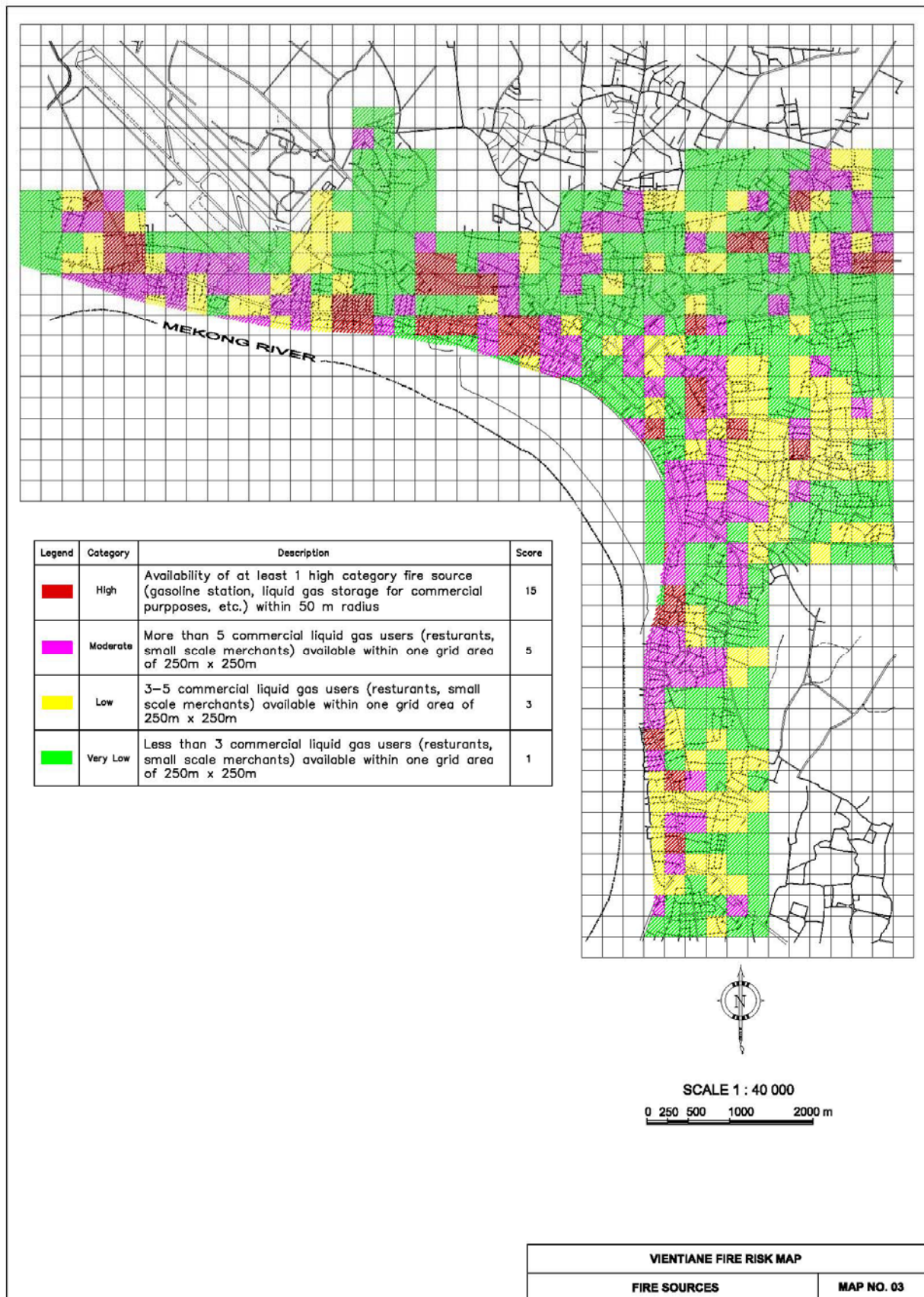


### 3 Building material type

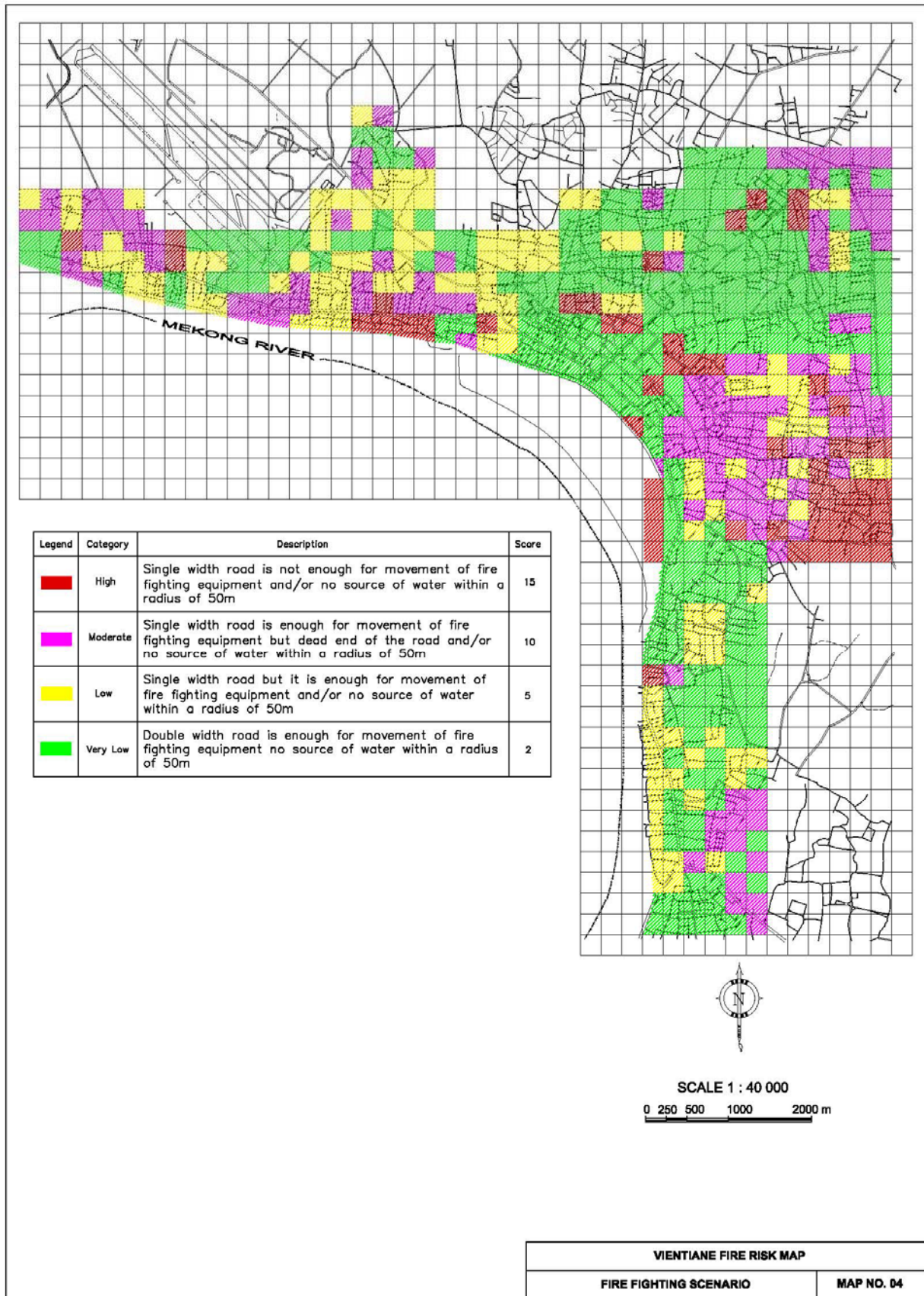




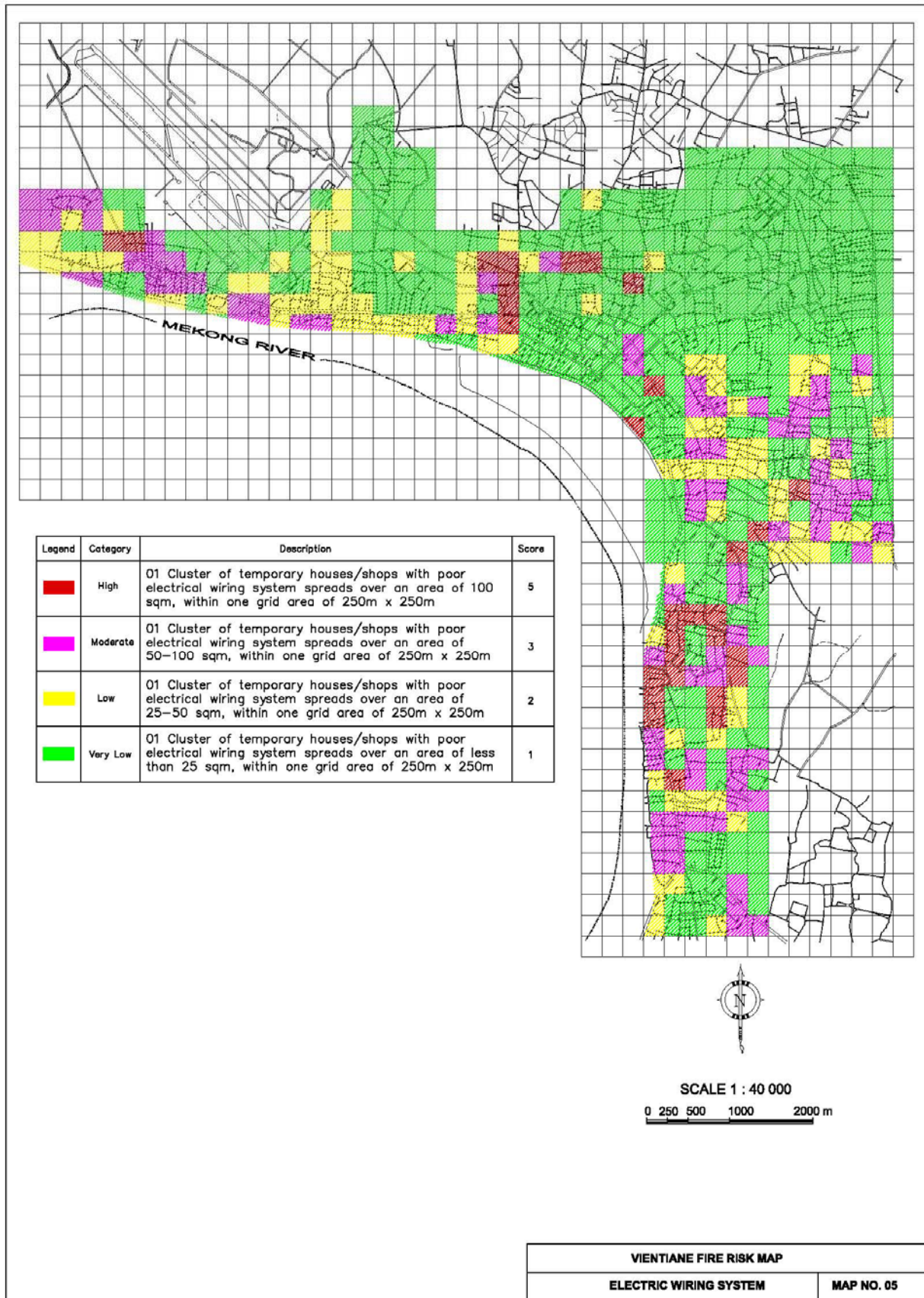
4 Fire sources



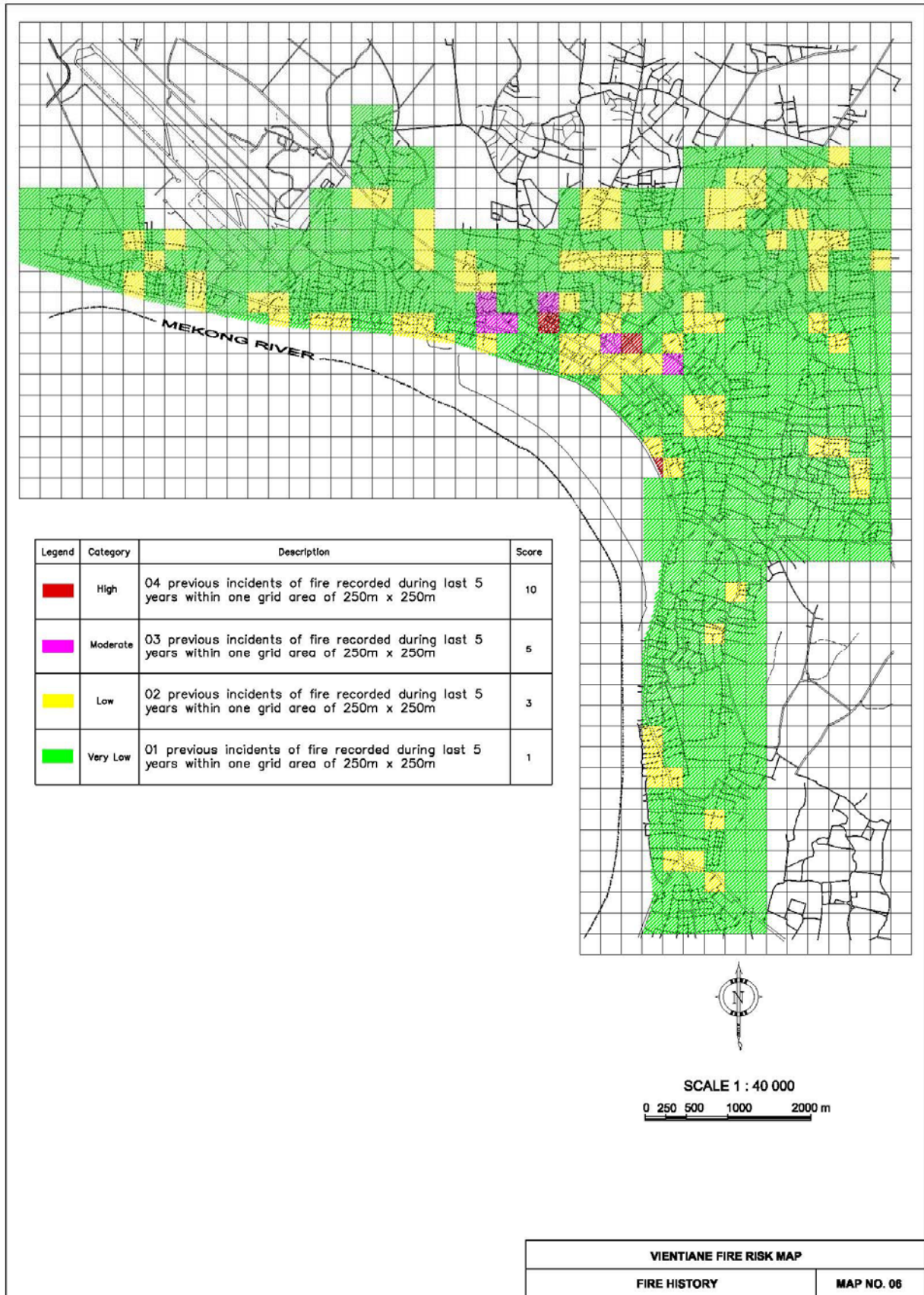
5 Fire fighting scenario



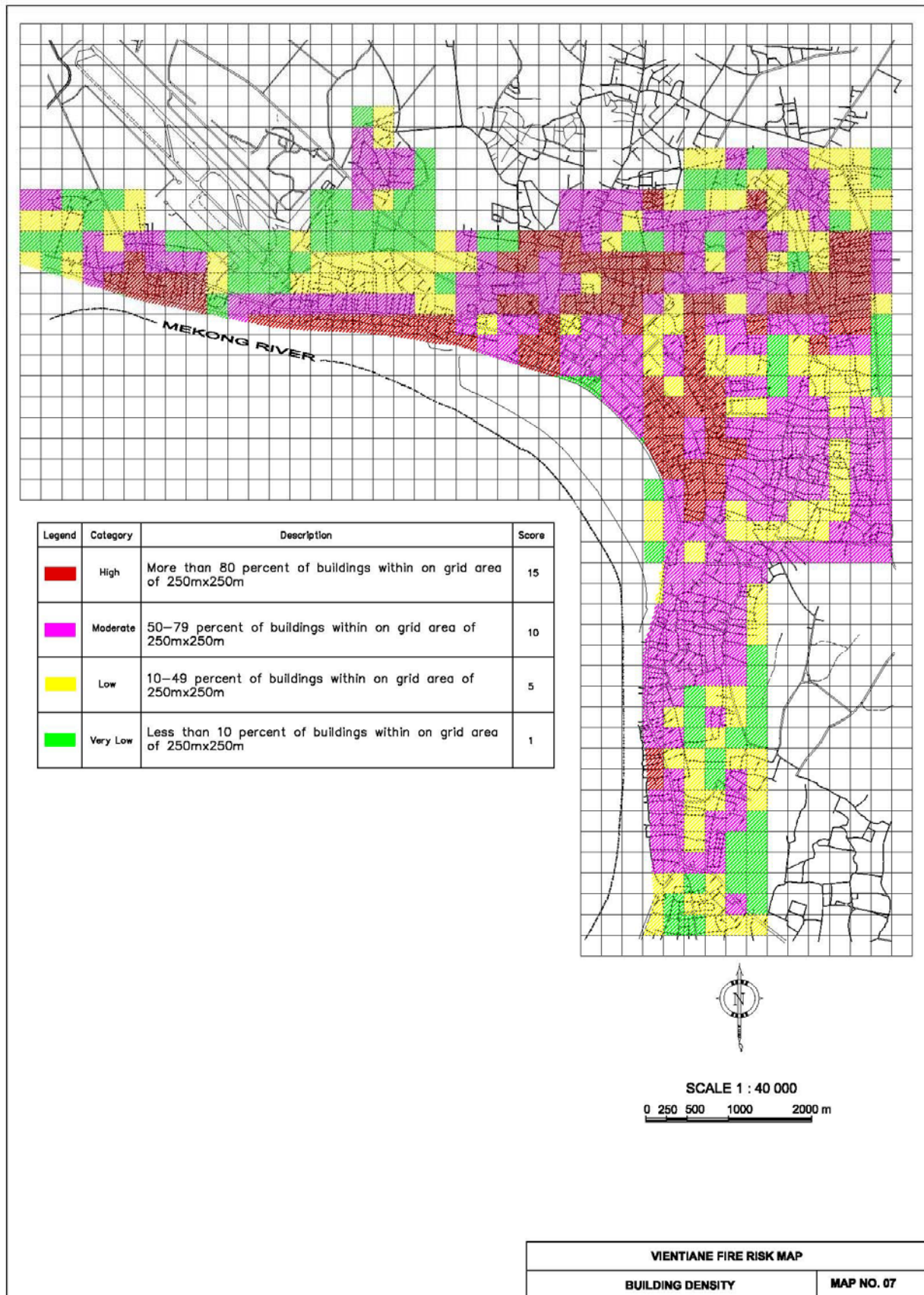
6 Electrical wiring system



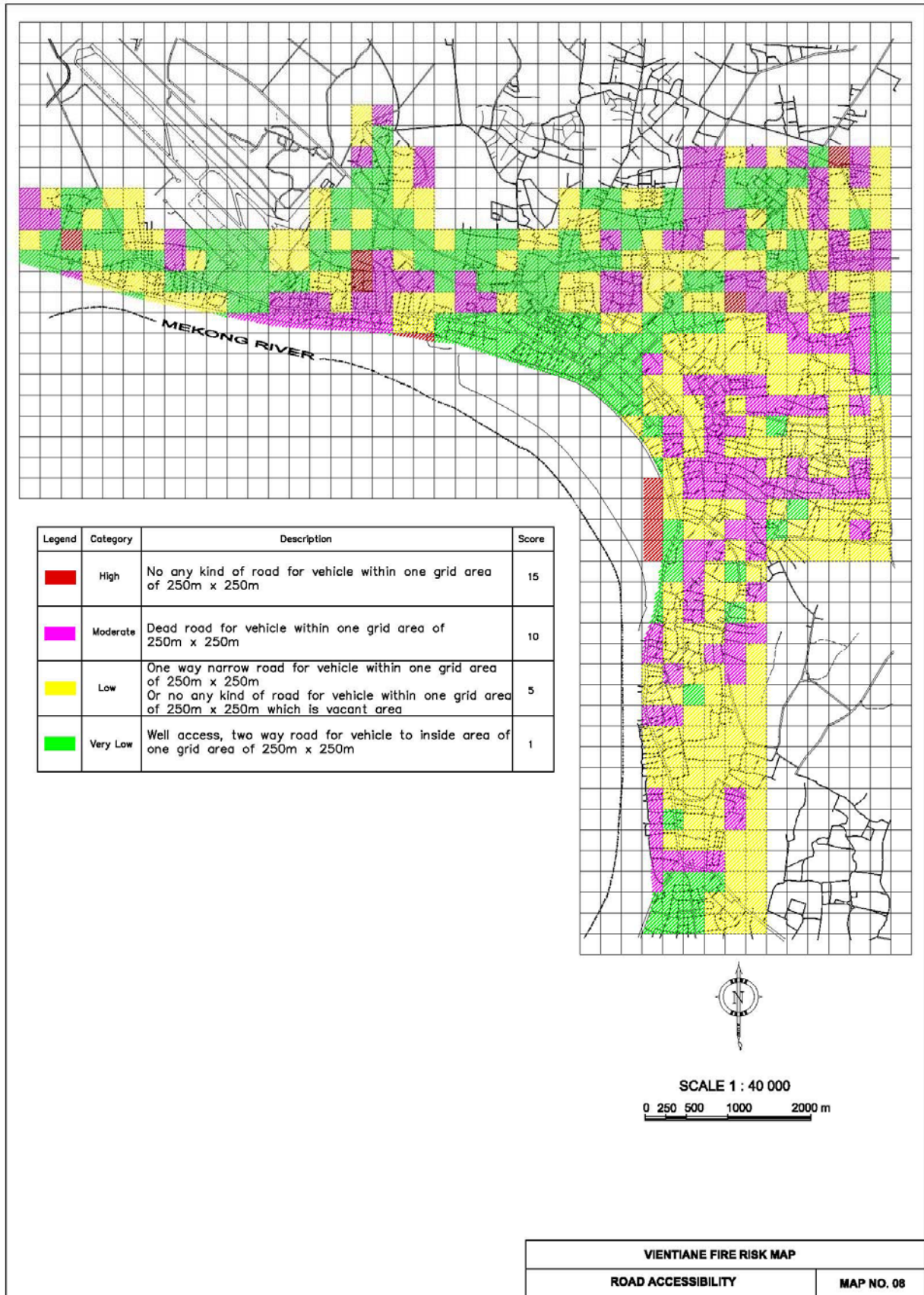
7 Fire history



## 8 Building density



9 Accessibility of the area



10 Fire risk zonation

