



# **LIVING CONDITIONS**

## Building materials and living area of housing

Shelter is a basic human requirement. It protects from the cold and rain, offers refuge, and provides privacy and comfort to a household. Therefore, and not surprisingly, access to adequate, safe and affordable housing was added as a target to the 2030 Agenda (Target 11.1 of SDG 11 "Sustainable Cities and Communities"). The type of building materials used in the construction of homes is an indicator of the resilience and sustainability of settlements. The 2030 Agenda also includes a target related to the importance of using local building materials (Target 11.c).

In the Lao PDR, modern building materials, especially roofing materials, are rapidly replacing traditionally used local materials. While the use of corrugated iron sheets has decreased slightly since 2005 (from 54% to 50%), the use of tiles has increased massively (from 13% to 42%). Thus, the use of other materials such as grass, wood and bamboo dropped sharply from 28% to less than 10%. There were fewer changes in the flooring materials used since 2005, but the observed shifts are still significant, with wood decreasing from 55 to 40% and bamboo from 15 to 5%, while concrete increased from 17 to 24% and tile from 8 to 25%. Interestingly, the share of houses with walls made of wood remained constant since 2005 (43%). Meanwhile, the use of bamboo for walls has decreased sharply (from 36 to 14%) and was replaced by brick and cement (from 18 to 41%). The shift from more traditional, locally sourced, and typically cheaper building materials such as bamboo, grass, and to some degree also wood, to locally produced or imported (and typically more expensive) industrial building materials such as tiles and concrete reflects a general improvement in living standards in the Lao PDR.

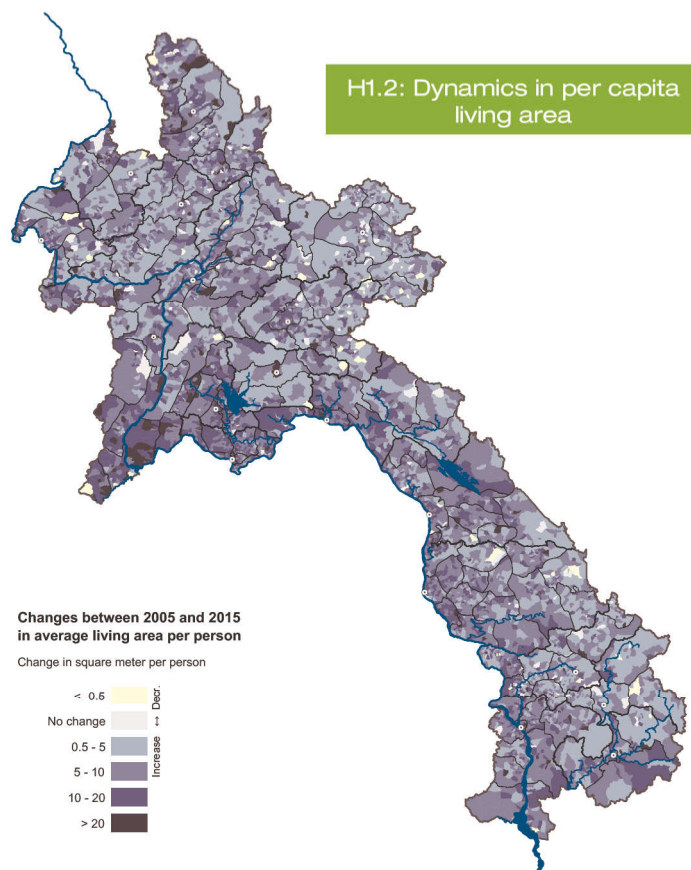
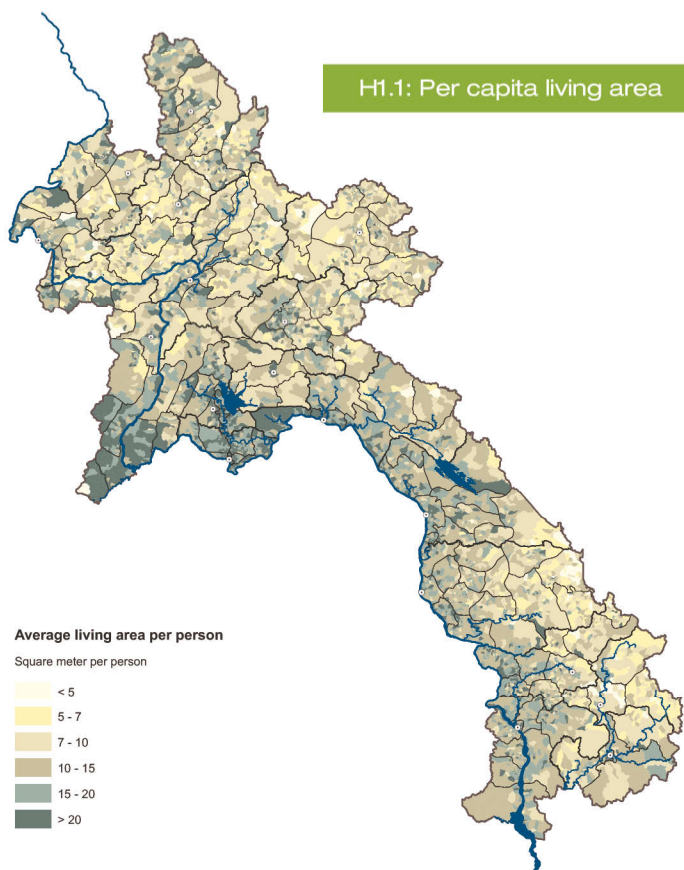
During the implementation of the PHC 2005 and 2015, the main building materials of each household's roof, walls, and floors were recorded. Spatial patterns in 2015 and changes since 2005

**Size of houses:** In 2015, around 96% of households in the Lao PDR owned the house in which they lived, whereas 2% were renting and another 2% were living in houses or apartments owned by the government. Slightly more than half of the population lives in moderately sized houses of 26 to 75 m<sup>2</sup>. Map H1.1 shows that the average living area per person is higher in the more accessible areas around Vientiane Capital City and along the Mekong River running south. In the north and southeast, the living area per person is significantly lower, usually below 10 m<sup>2</sup> per person.

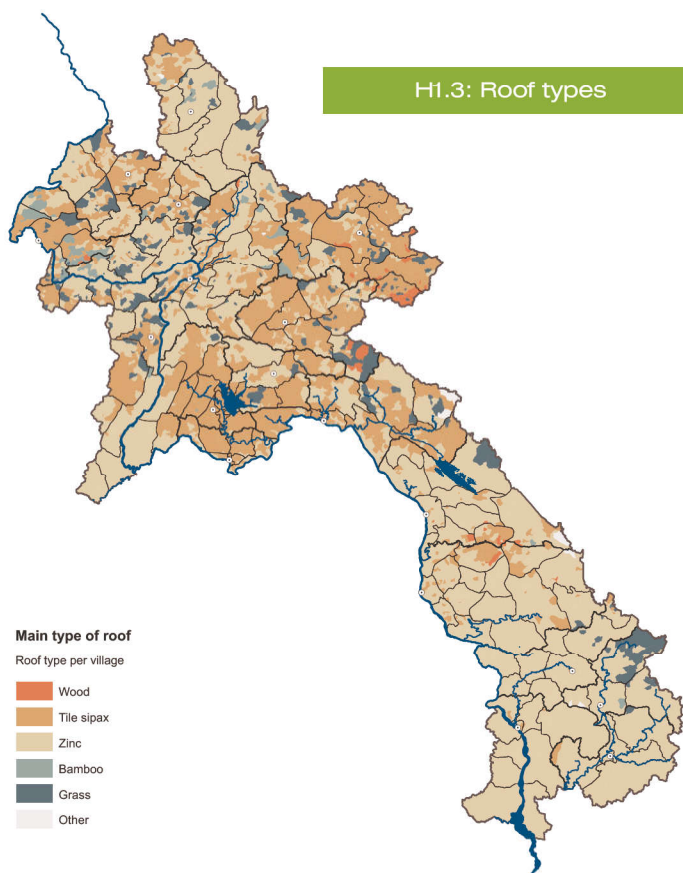
The living area per person increased across the country between 2005 and 2015, especially in urban areas, in the southwest, and in the south along the Mekong River (see Map H1.2). Most probably, the increase in living space per person is a result of increased living standards which means that people can afford to build and own larger houses, as well as due to the decrease in household sizes during the same period. In 2005, the average household size in the country was 5.9 people, whereas in 2015 it had dropped to 5.3.

**Roofing material** (Map H1.3): Corrugated iron sheets have conquered most of the country in terms of becoming the main roofing material (50% of all households), closely followed by the more expensive tiles (42%). Only small areas, mainly in the northwest and the southeast of the country, have a dominance of either bamboo or grass used as roofing materials. Interestingly, tile seems to be less popular in the south of the country, where the more economical corrugated iron sheets are clearly dominant (for example, more than three quarters of the houses in Attapeu Province use corrugated iron), whereas the typically more expensive tiles are dominant around Vientiane (69% in Vientiane Province) and from there towards the northeast, reflecting the local dynamics in living standards (see e.g. Map I2.2).

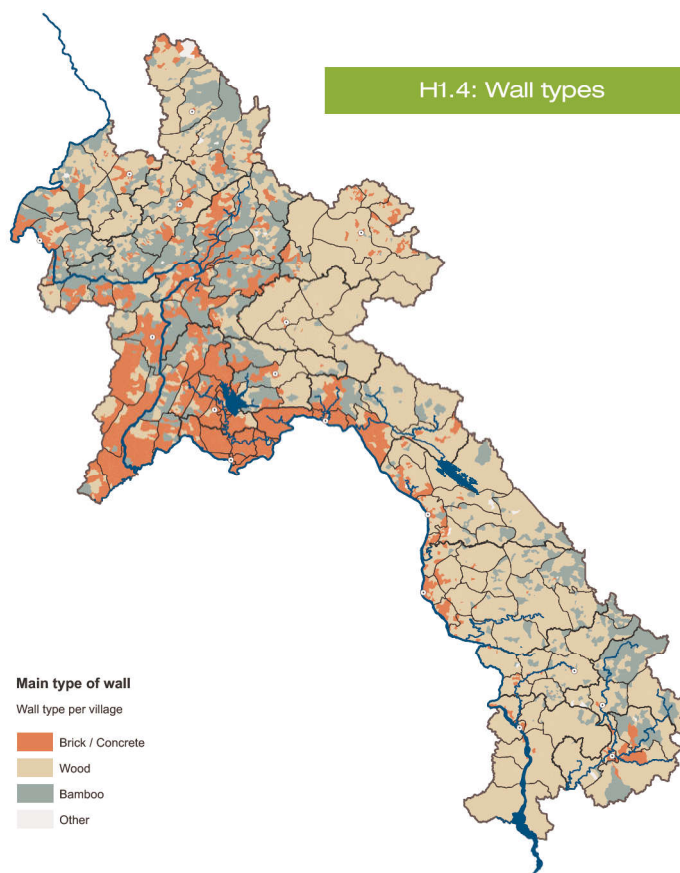
**Walls** (Map H1.4): Wood is also the preferred material for building walls (43% of all households), especially in the south and northeast where it is clearly dominant. The highest proportion is found in Xiengkhuang,



### H1.3: Roof types



### H1.4: Wall types

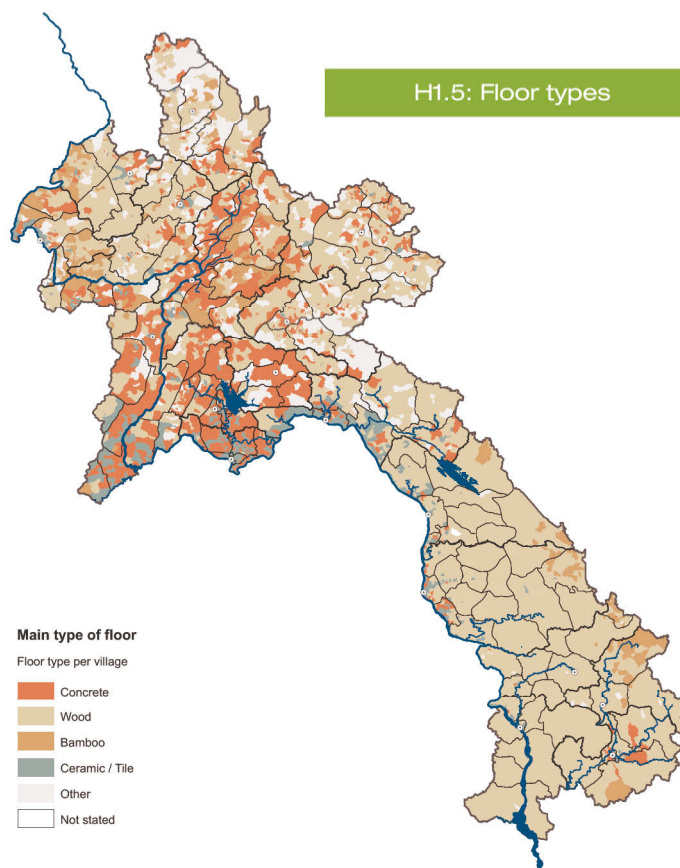


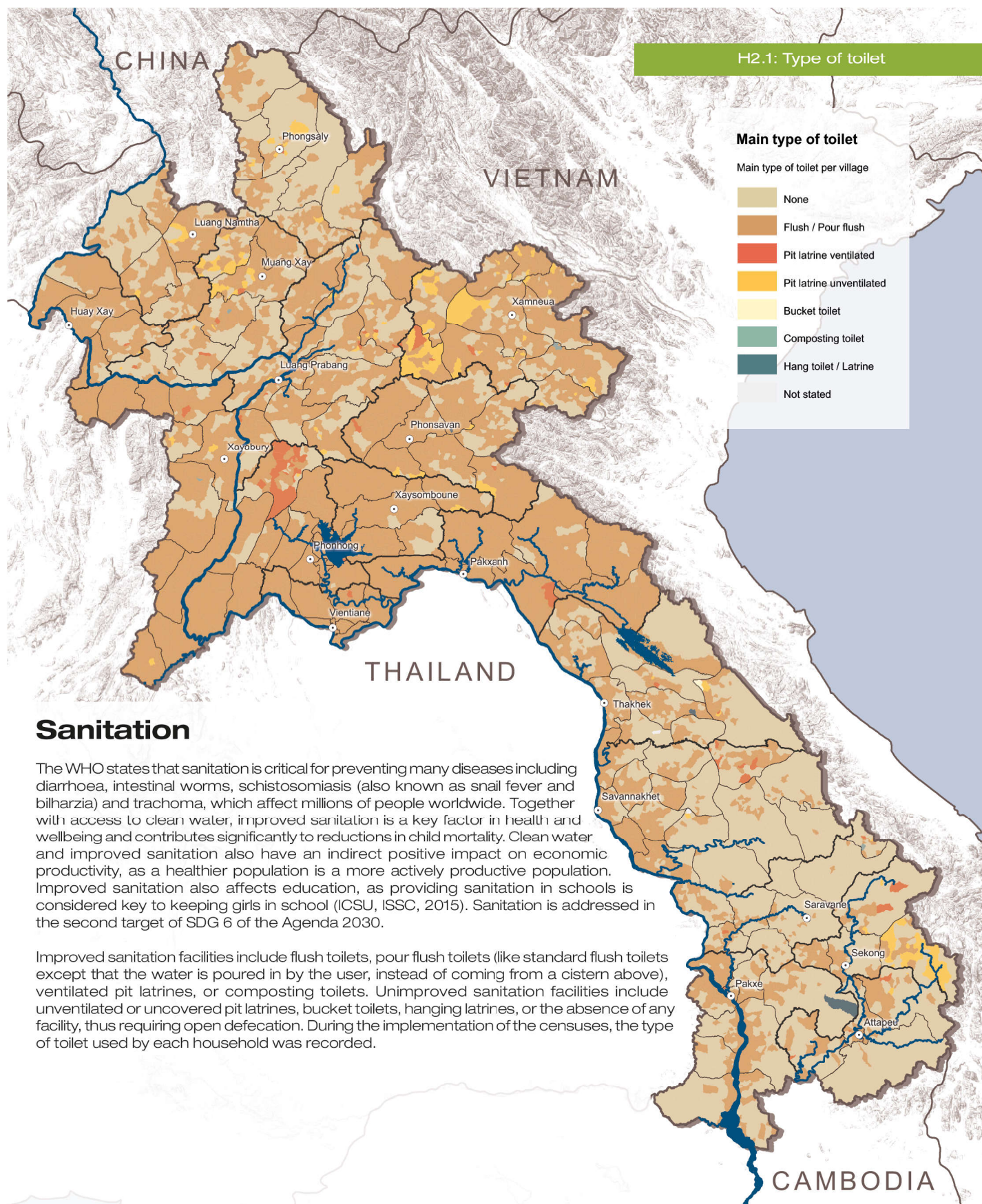
where three quarters of households use wood to build the walls of their houses. Champasak and Huaphanh follow with slightly over two thirds of houses built with wood walls. Bamboo is also still popular, especially in mountainous areas, for example in Luang Prabang, Phongsaly, Bokeo, Luang Namtha, and Oudomxai Provinces (which all range between 20% and 30%), as well as in the southeast in Savannakhet, Saravane, Sekong and Attapeu Provinces.

**Floors** (Map H1.5): Wood remains the preferred material for floors (40% of all households), especially in the south (for example, close to three quarters of households in Sekong and Saravane Provinces). The use of bamboo is restricted to smaller, mainly mountainous areas around Luang Prabang, Bokeo, northern Xayabury and western Luang Namtha, and in the southeast. In Vientiane, Xayabury, and Luang Prabang, especially along major roads and in more urbanized areas, concrete and ceramic floors are widespread, showing a trend towards the use of more sturdy building materials.

Even though it seems that Lao people are attached to the use of wood for the construction of walls and floors, there is a clear trend towards the use of more modern, sturdier materials for house construction. The replacement of traditional roofing materials such as bamboo and grass with corrugated iron sheets and tiles is an almost countrywide phenomenon that seems to herald the disappearance of traditional thatched roofs and their respective building skills. Similarly, tiles or cement floors are replacing wood and bamboo flooring which are less and less common, especially in urban areas and nearby. These changes, which are particularly fast in urban and other highly accessible areas, are a reflection of increased purchasing power of residents in these areas, but also a result of changed habits and standards in the population at large.

### H1.5: Floor types





## Sanitation

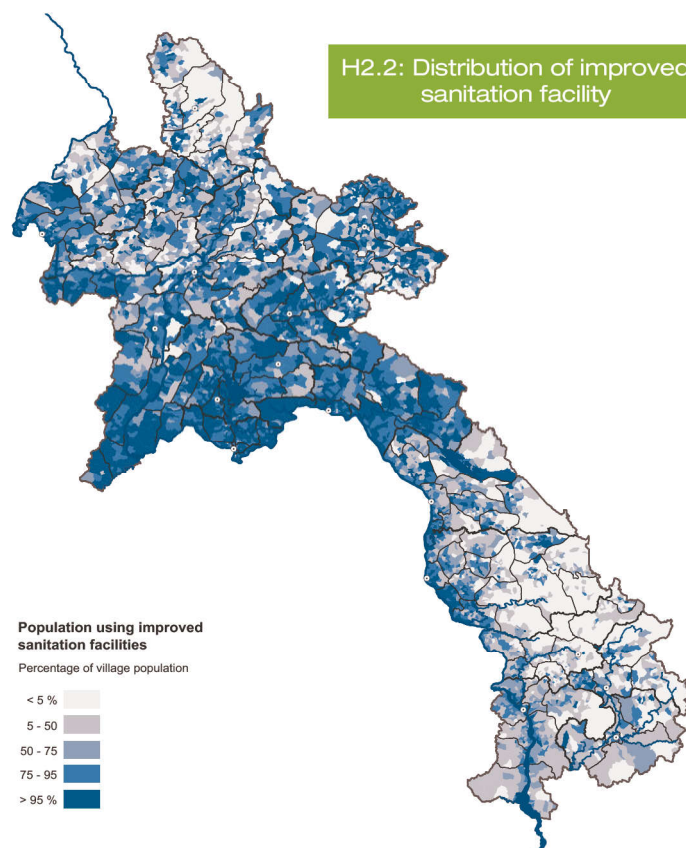
The WHO states that sanitation is critical for preventing many diseases including diarrhoea, intestinal worms, schistosomiasis (also known as snail fever and bilharzia) and trachoma, which affect millions of people worldwide. Together with access to clean water, improved sanitation is a key factor in health and wellbeing and contributes significantly to reductions in child mortality. Clean water and improved sanitation also have an indirect positive impact on economic productivity, as a healthier population is a more actively productive population. Improved sanitation also affects education, as providing sanitation in schools is considered key to keeping girls in school (ICSU, ISSC, 2015). Sanitation is addressed in the second target of SDG 6 of the Agenda 2030.

Improved sanitation facilities include flush toilets, pour flush toilets (like standard flush toilets except that the water is poured in by the user, instead of coming from a cistern above), ventilated pit latrines, or composting toilets. Unimproved sanitation facilities include unventilated or uncovered pit latrines, bucket toilets, hanging latrines, or the absence of any facility, thus requiring open defecation. During the implementation of the censuses, the type of toilet used by each household was recorded.

### Spatial patterns in 2015

In the Lao PDR, close to three quarters (73.2%) of the population used improved sanitation facilities in 2015. According to the WHO and UNICEF, of the remaining 26.8% that are using unimproved facilities, 22.1% engage in open defecation. The share of people using improved sanitation facilities is above 90% in Vientiane Capital City and Vientiane, Xayabury, and Borikhamxay Provinces. It is particularly low in Saravane (36.8%) and Phongsaly (43.9%).

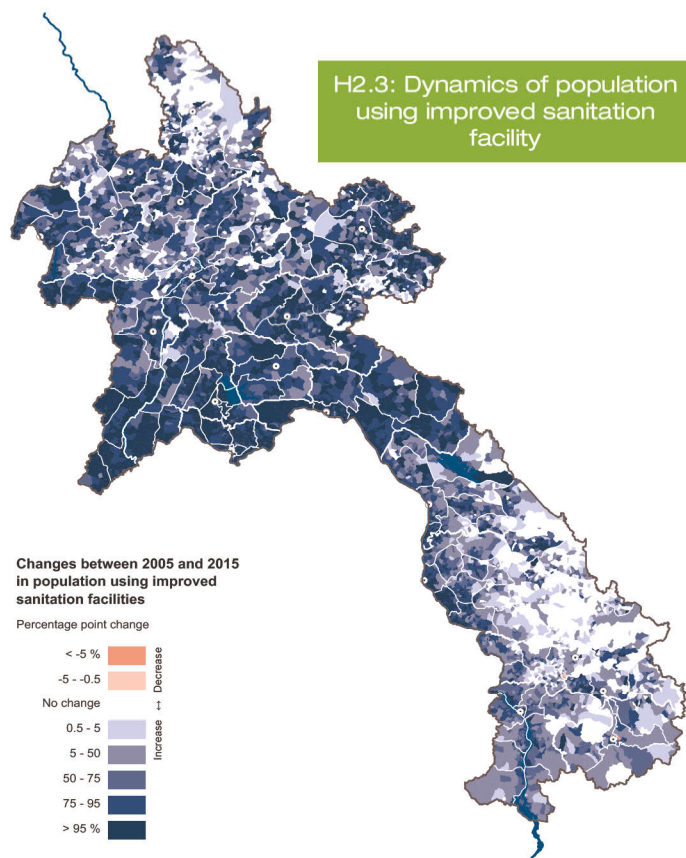
Map H2.1 shows that flush and pour flush toilets are widespread in the central part of the country in Xayabury, Vientiane, Xiengkhuang, and Borikhamxay Provinces. In large parts of the south, as well as in the far north, most households have no toilet at all.

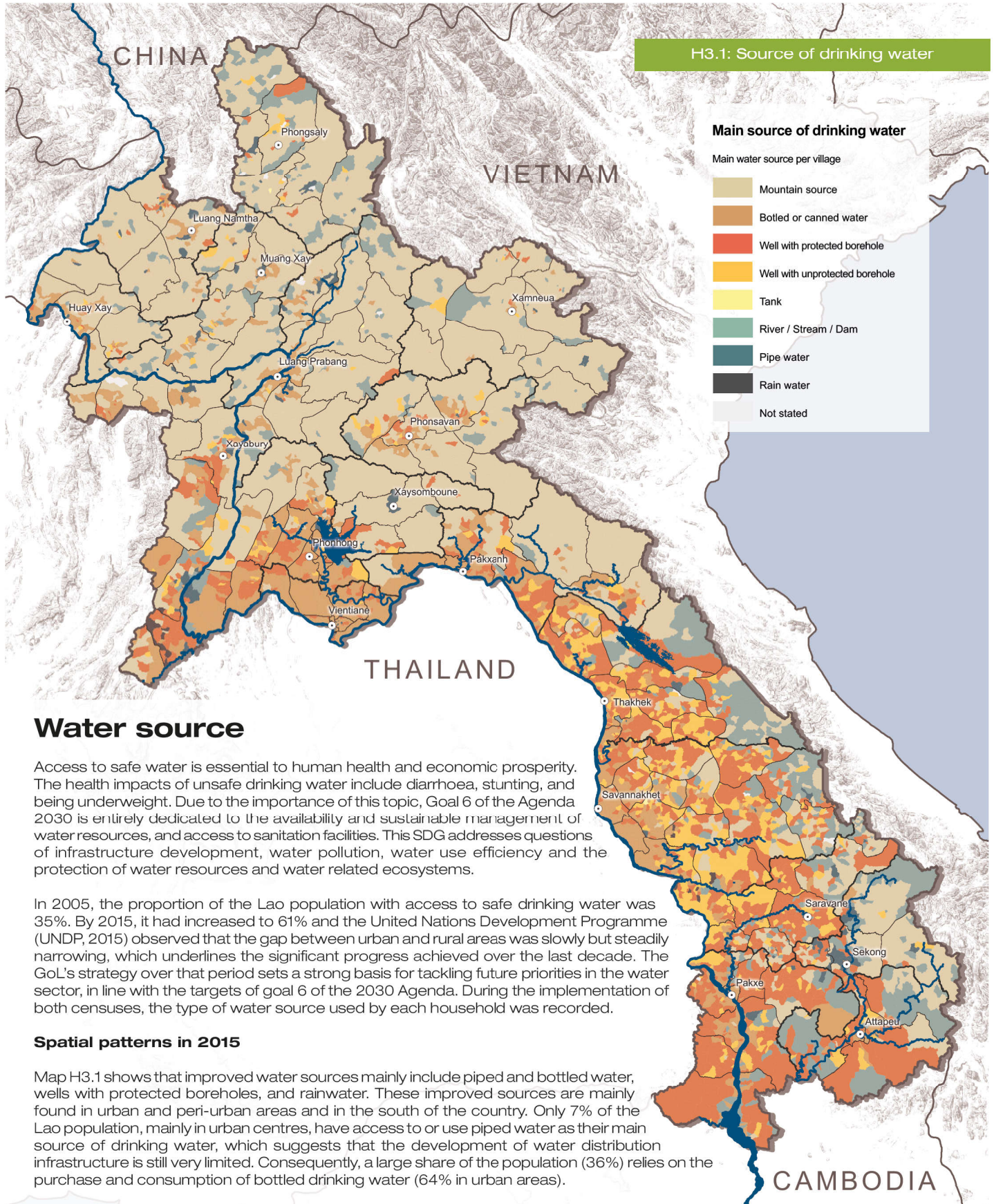


### Dynamics between 2005 and 2015

Map H2.3 shows that between 2005 and 2015, access to improved sanitation facilities has increased in large parts across the country and no areas have experienced a decrease in sanitation facility quality. The progress is most significant in central and much of northern Lao PDR (including in Vientiane Capital City and Vientiane, Xayabury and Borikhamxay Provinces) where access for most places increased by more than 75%. In the southeast (Savannakhet, Saravane, and Sekong), as well as in Phongsaly, access to improved sanitation facilities has remained more or less stagnant and at a very low level (compare Map H2.2), with slight improvements in a limited number of villages only.

The World Bank attributes the Lao PDR's rapid progress in access to improved sanitation facilities to the GoL's adoption of the Community-Led Total Sanitation (CLTS) approach. This approach was integrated into teaching curriculums and 469 provincial and district level Government staff were trained on sanitation topics (World Bank, 2016). Despite these substantial efforts, the Lao PDR still has the second-highest level of open defecation in the region, after Cambodia.





### Water source

Access to safe water is essential to human health and economic prosperity. The health impacts of unsafe drinking water include diarrhoea, stunting, and being underweight. Due to the importance of this topic, Goal 6 of the Agenda 2030 is entirely dedicated to the availability and sustainable management of water resources, and access to sanitation facilities. This SDG addresses questions of infrastructure development, water pollution, water use efficiency and the protection of water resources and water related ecosystems.

In 2005, the proportion of the Lao population with access to safe drinking water was 35%. By 2015, it had increased to 61% and the United Nations Development Programme (UNDP, 2015) observed that the gap between urban and rural areas was slowly but steadily narrowing, which underlines the significant progress achieved over the last decade. The GoL's strategy over that period sets a strong basis for tackling future priorities in the water sector, in line with the targets of goal 6 of the 2030 Agenda. During the implementation of both censuses, the type of water source used by each household was recorded.

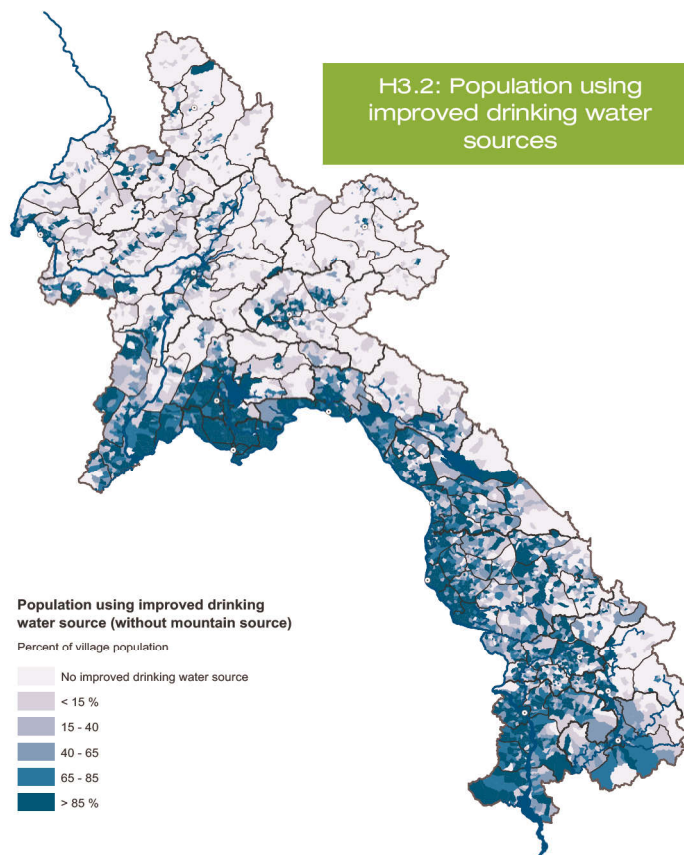
#### Spatial patterns in 2015

Map H3.1 shows that improved water sources mainly include piped and bottled water, wells with protected boreholes, and rainwater. These improved sources are mainly found in urban and peri-urban areas and in the south of the country. Only 7% of the Lao population, mainly in urban centres, have access to or use piped water as their main source of drinking water, which suggests that the development of water distribution infrastructure is still very limited. Consequently, a large share of the population (36%) relies on the purchase and consumption of bottled drinking water (64% in urban areas).

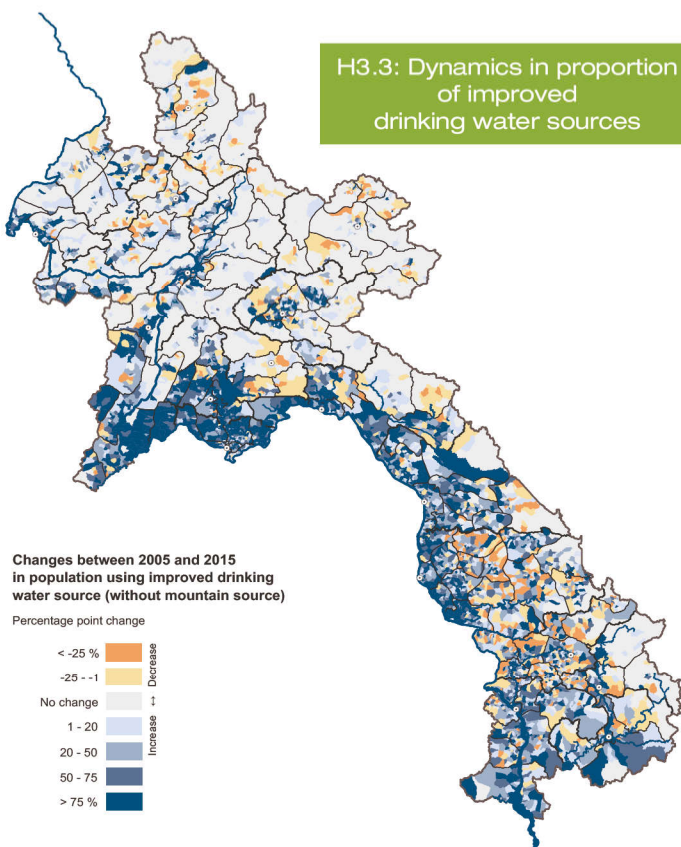
Unimproved water sources include mountain sources, wells with unprotected boreholes, and rivers or streams. Mountain sources are, by far, the most widespread source of water in the north of the country. One quarter of the overall population of the Lao PDR get their drinking water from mountain sources. Despite being categorized as unimproved, the quality of water from mountain sources is often good and its consumption is not a major public health concern. Waterborne diseases are more frequently contracted from unprotected wells, which are used by around 8% of the country's population. In the southeast, people often use water from rivers and streams. Overall, 6% of the population uses surface water bodies (rivers, streams and reservoirs) as a source for drinking water.

Around two thirds of the population of the Lao PDR use improved water sources. In urban areas, the share is as high as 90%, whereas in rural and remote areas it drops to 13%, mainly due to the very widespread use of mountain sources (Map H3.2). Thus, disparities in access to improved water sources are still quite significant. Apart from the various types of water sources, the distances between these sources and the households that depend on them are also a critical aspect in the assessment of access to water. For example, 94% of the households relying on piped water have water piped to their place of residence, but 2% of households have to travel more than 1 km to access it. In the case of rivers, streams, and bottled water, 5% of households have to travel more than 1 km to access these sources, and in the case of unprotected wells and boreholes, 7.5% have to travel this distance for water.

H3.2: Population using improved drinking water sources



H3.3: Dynamics in proportion of improved drinking water sources

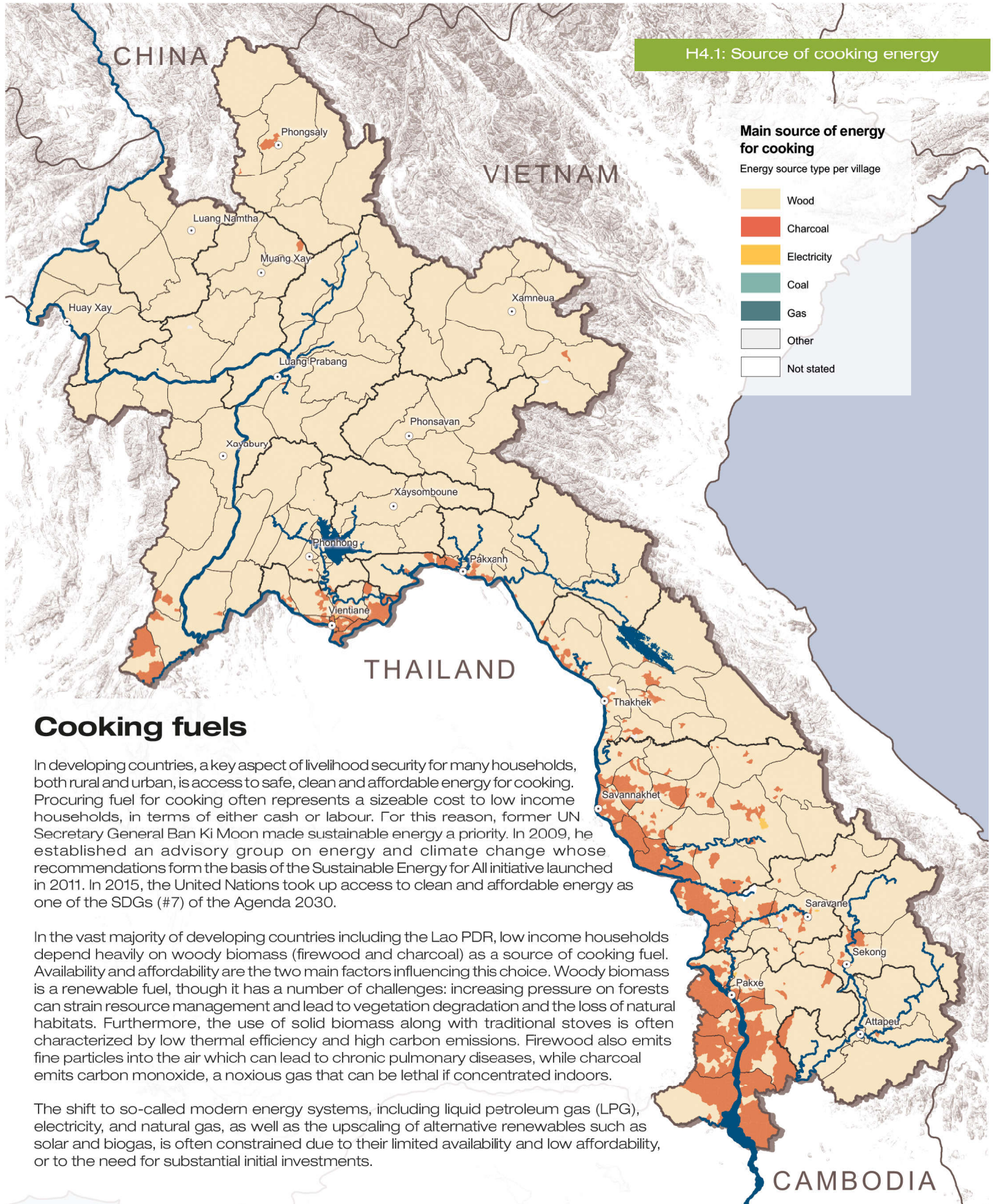


### Dynamics between 2005 and 2015

Map H3.3 shows that between 2005 and 2015, the use of improved water sources increased significantly in Vientiane Capital City, in the south and west of Vientiane Province, in southern Xayabury Province, and in the Mekong River valley of central Lao PDR and Savannakhet. In remote and mountainous areas, the proportion of the population using improved water sources did not change much, especially in the north, where mountain sources still play a very dominant role in terms of water supply, and will probably continue to do so in the future. Thus, the future improvement of drinking water safety in these areas will mainly consist of protecting mountain springs and installing distribution systems from the springs to villages that prevent any contamination along the way. Map H3.3 also shows that there has been degradation of the access to improved water sources in a number of villages scattered across the northern uplands and also in many parts of the south.

The observed improved situation in access to safe water is associated with relevant reductions in the time required to meet basic water needs. These benefits have subsequently led to an increase in the labour supply and therefore the productive potential of the economy (Boualapha and Philavong, 2011).

H4.1: Source of cooking energy



### Cooking fuels

In developing countries, a key aspect of livelihood security for many households, both rural and urban, is access to safe, clean and affordable energy for cooking. Procuring fuel for cooking often represents a sizeable cost to low income households, in terms of either cash or labour. For this reason, former UN Secretary General Ban Ki Moon made sustainable energy a priority. In 2009, he established an advisory group on energy and climate change whose recommendations form the basis of the Sustainable Energy for All initiative launched in 2011. In 2015, the United Nations took up access to clean and affordable energy as one of the SDGs (#7) of the Agenda 2030.

In the vast majority of developing countries including the Lao PDR, low income households depend heavily on woody biomass (firewood and charcoal) as a source of cooking fuel. Availability and affordability are the two main factors influencing this choice. Woody biomass is a renewable fuel, though it has a number of challenges: increasing pressure on forests can strain resource management and lead to vegetation degradation and the loss of natural habitats. Furthermore, the use of solid biomass along with traditional stoves is often characterized by low thermal efficiency and high carbon emissions. Firewood also emits fine particles into the air which can lead to chronic pulmonary diseases, while charcoal emits carbon monoxide, a noxious gas that can be lethal if concentrated indoors.

The shift to so-called modern energy systems, including liquid petroleum gas (LPG), electricity, and natural gas, as well as the upscaling of alternative renewables such as solar and biogas, is often constrained due to their limited availability and low affordability, or to the need for substantial initial investments.



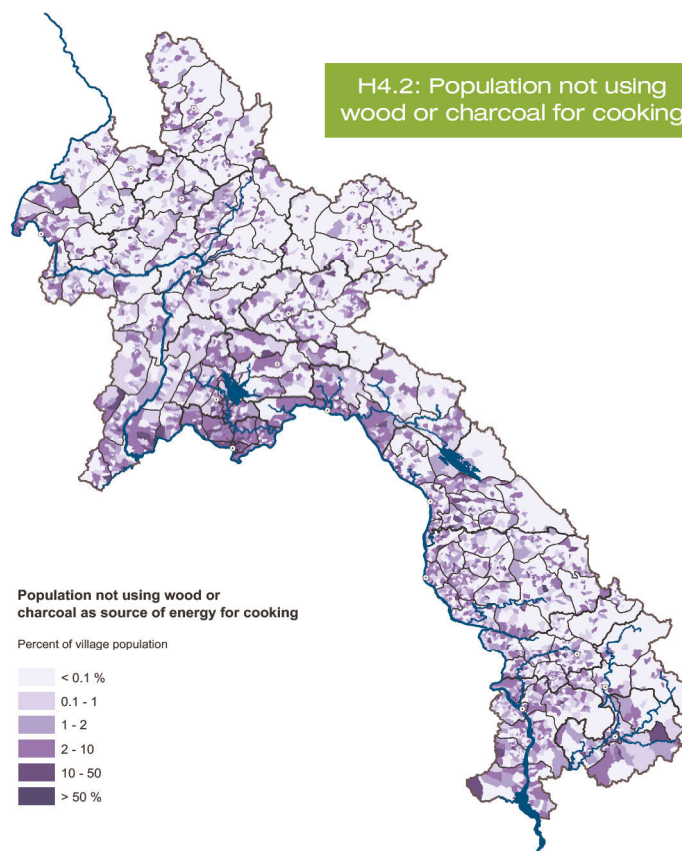
During the implementation of the censuses, the main type of energy source used for cooking in each household was recorded using the following categories: electricity, paraffin, wood, coal, charcoal, sawdust, gas, or other.

## Spatial patterns in 2015

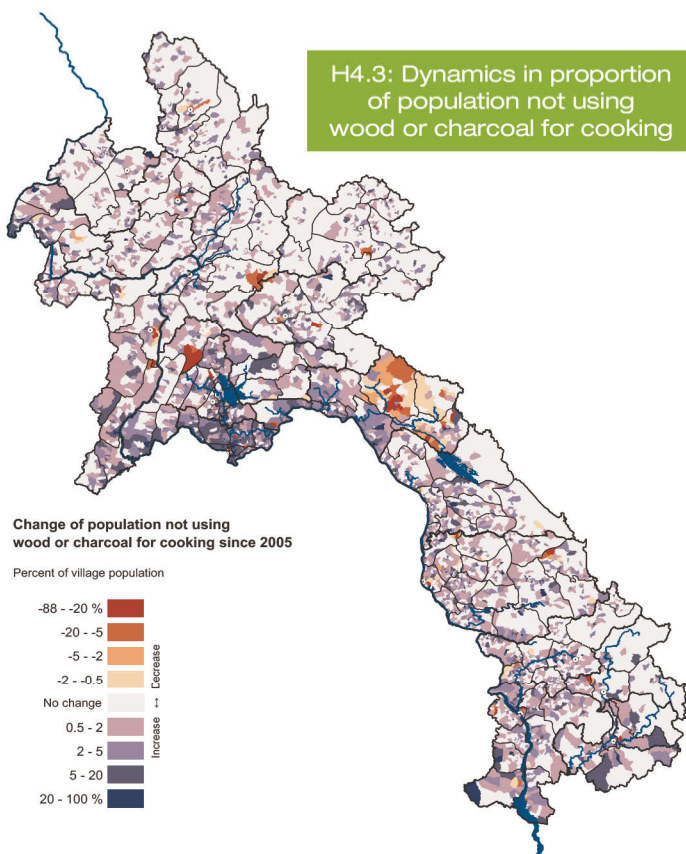
Woody biomass, typically in the form of firewood and charcoal, is by far the most dominant source of cooking fuel in the Lao PDR, as illustrated in Map H4.1. In total, 67% of all households use firewood for cooking and around one quarter use charcoal. Firewood is the primary source of energy, especially in rural areas where 88% of households use it. In provinces dominated by forested mountain areas, such as Phongsaly, Xaysomboune, and Oudomxai, more than 90% of households use firewood as their primary source of energy. Firewood is a very popular fuel source in these areas because it is readily available at low or no cost.

Charcoal is preferred in more densely populated places, in and around urban centres, for example in Vientiane Capital City and along the Mekong River in the south. In urban areas, 36% of the households use charcoal as their primary fuel for cooking. There are two main reasons for the dominance of charcoal in urban areas. First, it is lighter and easier to transport and its energy content per weight is thus higher than firewood. Second, the combustion of charcoal produces less smoke than wood, making it more convenient for use in towns. Only a small minority of the households in the Lao PDR mainly use gas or electricity to cook, which is more frequently used only in urban areas (for example, 8 and 17% of the households in Vientiane Capital City use gas and electricity respectively). In some places, households often use electricity, coal, gas and other fuels as secondary sources of energy to supplement wood and charcoal.

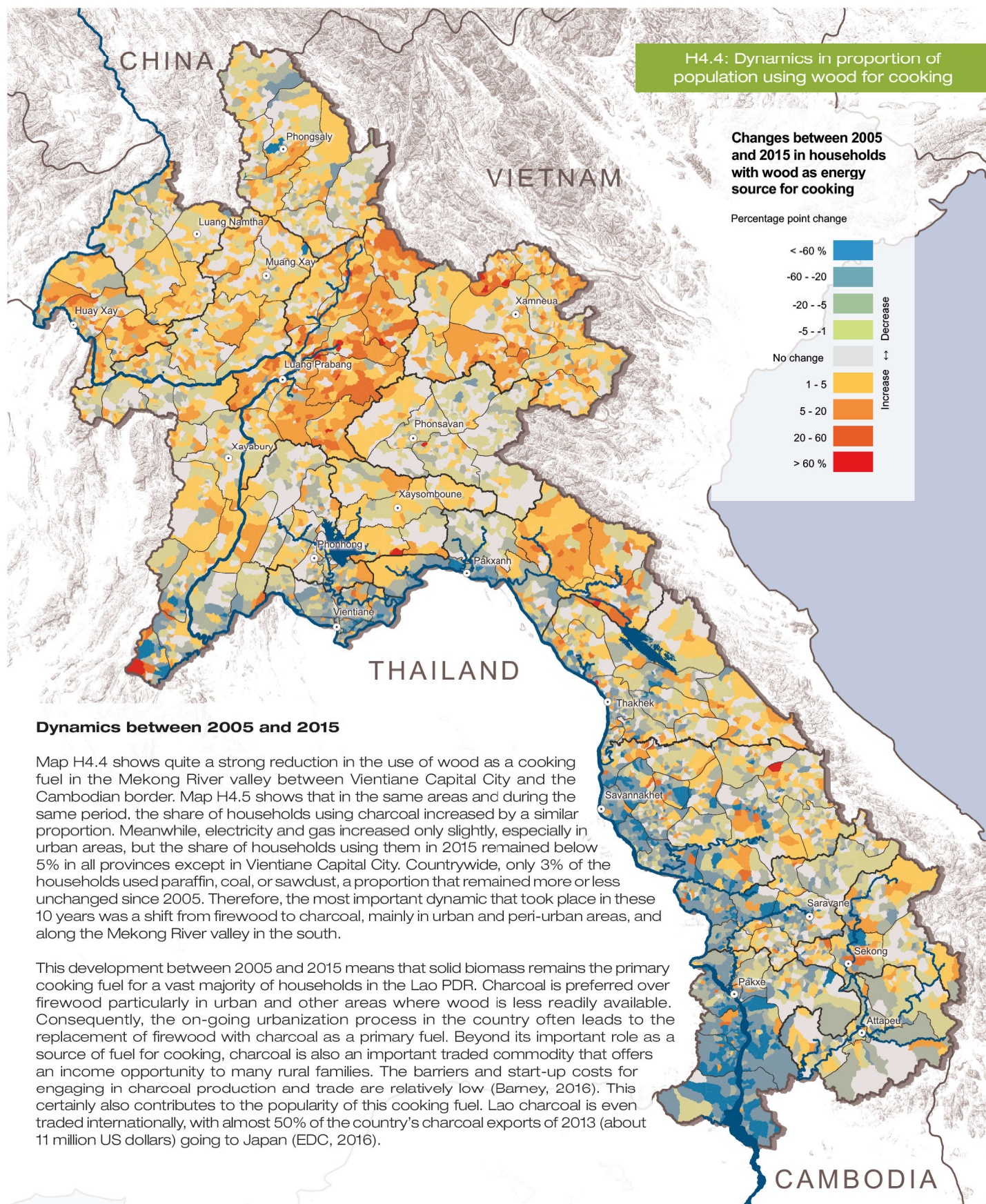
H4.2: Population not using wood or charcoal for cooking



H4.3: Dynamics in proportion of population not using wood or charcoal for cooking



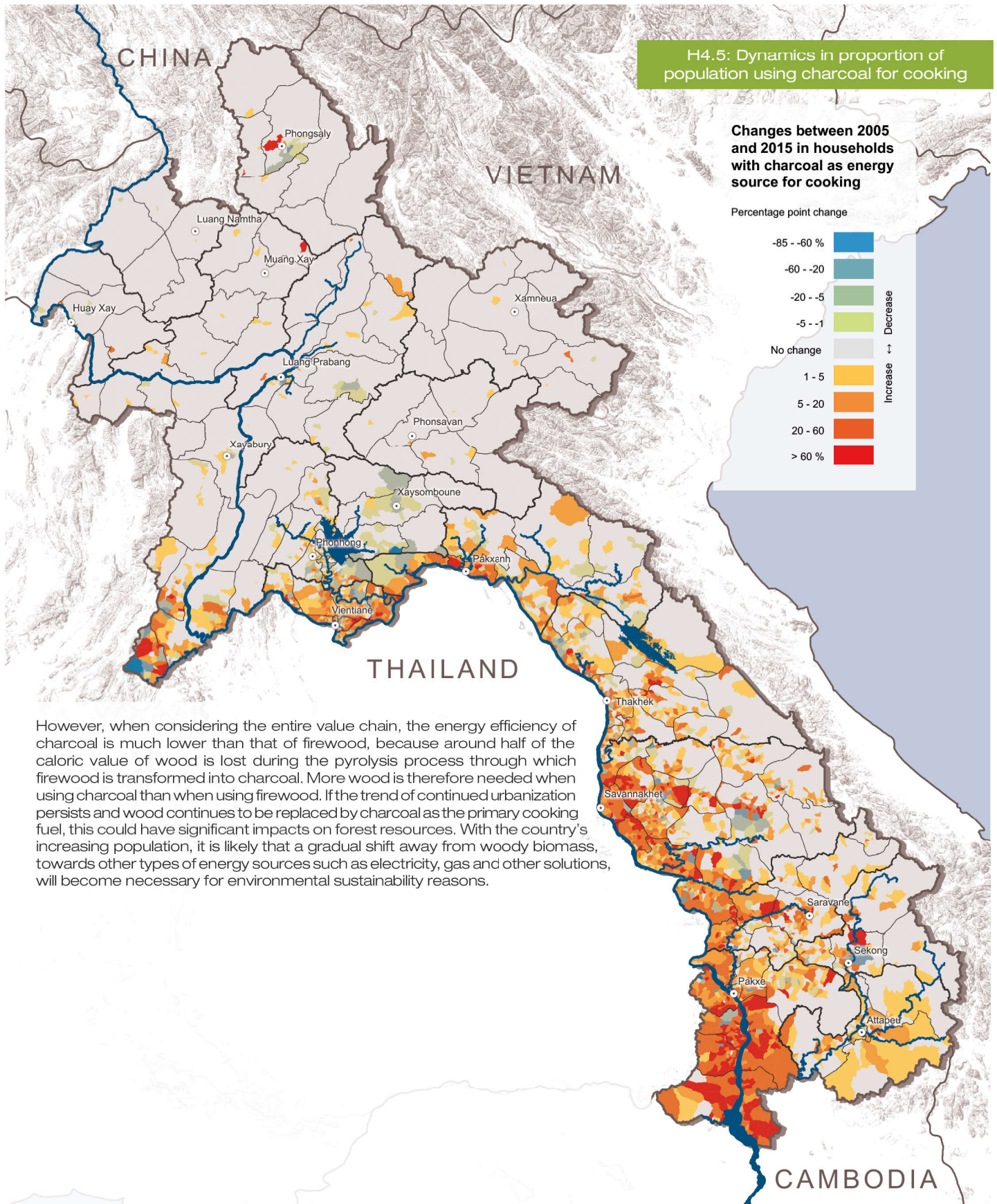
The current dependence of households in the Lao PDR on firewood and charcoal is mainly due to the availability and affordability of these two sources, which make them more attractive than so-called modern energy systems, especially for low-income households. Traditions and habits also partially explain the dominance of these two fuels. The popularity particularly of wood, but also charcoal, can be seen by the trends presented on Map H4.2, which shows that, especially in rural areas, the share of households not using wood or charcoal is extremely low (below 1% in most areas), and that even in more urbanized areas, it rarely exceeds 50%.



### Dynamics between 2005 and 2015

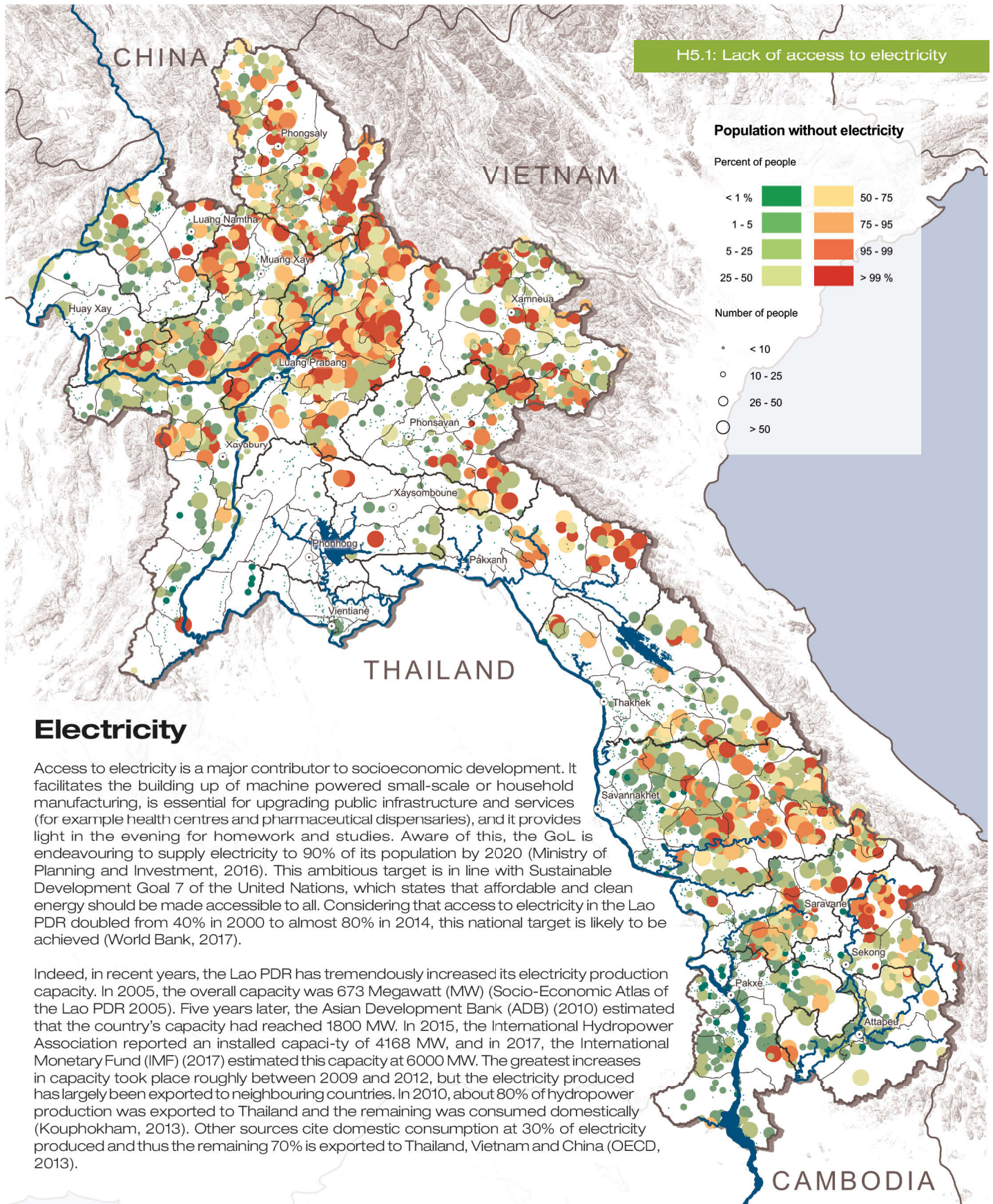
Map H4.4 shows quite a strong reduction in the use of wood as a cooking fuel in the Mekong River valley between Vientiane Capital City and the Cambodian border. Map H4.5 shows that in the same areas and during the same period, the share of households using charcoal increased by a similar proportion. Meanwhile, electricity and gas increased only slightly, especially in urban areas, but the share of households using them in 2015 remained below 5% in all provinces except in Vientiane Capital City. Countrywide, only 3% of the households used paraffin, coal, or sawdust, a proportion that remained more or less unchanged since 2005. Therefore, the most important dynamic that took place in these 10 years was a shift from firewood to charcoal, mainly in urban and peri-urban areas, and along the Mekong River valley in the south.

This development between 2005 and 2015 means that solid biomass remains the primary cooking fuel for a vast majority of households in the Lao PDR. Charcoal is preferred over firewood particularly in urban and other areas where wood is less readily available. Consequently, the on-going urbanization process in the country often leads to the replacement of firewood with charcoal as a primary fuel. Beyond its important role as a source of fuel for cooking, charcoal is also an important traded commodity that offers an income opportunity to many rural families. The barriers and start-up costs for engaging in charcoal production and trade are relatively low (Barney, 2016). This certainly also contributes to the popularity of this cooking fuel. Lao charcoal is even traded internationally, with almost 50% of the country's charcoal exports of 2013 (about 11 million US dollars) going to Japan (EDC, 2016).



However, when considering the entire value chain, the energy efficiency of charcoal is much lower than that of firewood, because around half of the caloric value of wood is lost during the pyrolysis process through which firewood is transformed into charcoal. More wood is therefore needed when using charcoal than when using firewood. If the trend of continued urbanization persists and wood continues to be replaced by charcoal as the primary cooking fuel, this could have significant impacts on forest resources. With the country's increasing population, it is likely that a gradual shift away from woody biomass, towards other types of energy sources such as electricity, gas and other solutions, will become necessary for environmental sustainability reasons.

H5.1: Lack of access to electricity



**Electricity**

Access to electricity is a major contributor to socioeconomic development. It facilitates the building up of machine powered small-scale or household manufacturing, is essential for upgrading public infrastructure and services (for example health centres and pharmaceutical dispensaries), and it provides light in the evening for homework and studies. Aware of this, the GoL is endeavouring to supply electricity to 90% of its population by 2020 (Ministry of Planning and Investment, 2016). This ambitious target is in line with Sustainable Development Goal 7 of the United Nations, which states that affordable and clean energy should be made accessible to all. Considering that access to electricity in the Lao PDR doubled from 40% in 2000 to almost 80% in 2014, this national target is likely to be achieved (World Bank, 2017).

Indeed, in recent years, the Lao PDR has tremendously increased its electricity production capacity. In 2005, the overall capacity was 673 Megawatt (MW) (Socio-Economic Atlas of the Lao PDR 2005). Five years later, the Asian Development Bank (ADB) (2010) estimated that the country's capacity had reached 1800 MW. In 2015, the International Hydropower Association reported an installed capacity of 4168 MW, and in 2017, the International Monetary Fund (IMF) (2017) estimated this capacity at 6000 MW. The greatest increases in capacity took place roughly between 2009 and 2012, but the electricity produced has largely been exported to neighbouring countries. In 2010, about 80% of hydropower production was exported to Thailand and the remaining was consumed domestically (Kouphokham, 2013). Other sources cite domestic consumption at 30% of electricity produced and thus the remaining 70% is exported to Thailand, Vietnam and China (OECD, 2013).

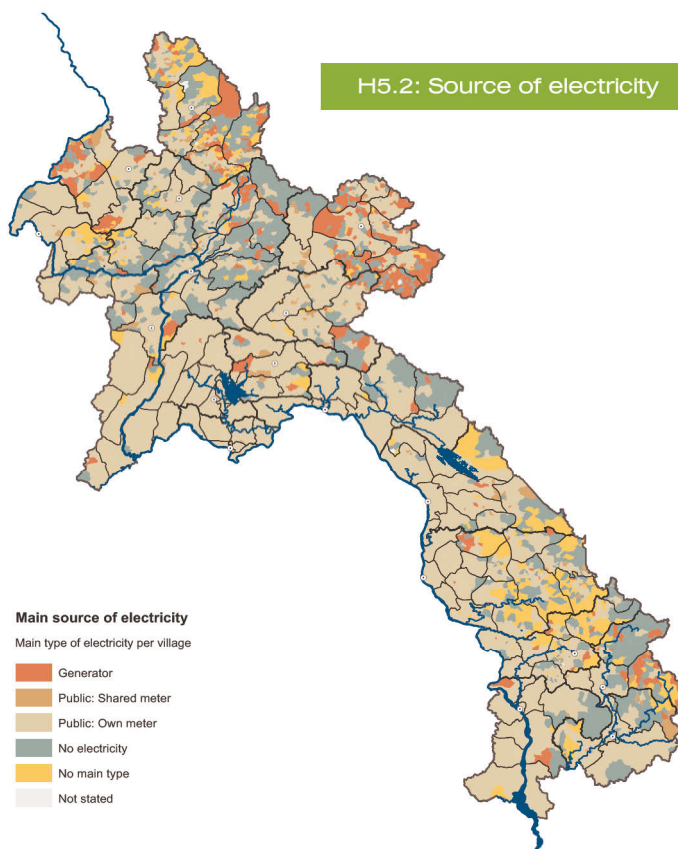
During the implementation of both censuses, each household was asked whether they have access to electricity, and whether it was from a public grid or a private generator or battery.

**Spatial patterns in 2015**

Almost all inhabitants of Vientiane Capital City and the country's provincial capitals throughout the country had access to electricity. However, access to electricity is far lower in rural areas, both in the north and south of the country, whereas access in urban areas is comparatively high (97%). Around 84% of the population in the Lao PDR has access to electricity through a public grid system. Map H5.1 presents the absolute number of people without access to electricity using circles of different sizes, and the share of the village population with access to electricity in green and red shades. Access is better near roads (82%) and drops sharply in remote areas without road access (37%) (see Maps H5.1 and A2.1). Map H5.1 reveals that many of these areas are not densely populated, and yet large numbers of rural people are still without access to electricity. This illustrates a sharp divide in terms of public infrastructure between more accessible and remote rural areas in the country. It also highlights the difficulty of connecting areas for which network expansion is costly – for example, due to the rugged terrain of such areas (see Map A1.2) – yet the number of potential subscribers (refer to Map B1.1) and therefore the return on investment are low.

In such areas, other sources of electricity could play an important role by substituting the national grid. Map H5.2 shows that the use of generators seems to be the only realistic alternative to electricity supplied by the public grid in use. Generators are used especially in peripheral regions in the north and south of the country which are not easily accessible and that are not connected to the national grid. It is important to note that Map H5.2 only shows the main source of electricity used in each village. Thus, it is possible that secondary

H5.2: Source of electricity



sources of electricity, such as solar power, are present in many parts of the country but not reflected in the map. Countrywide, around 9% of households use “other” sources of electricity, among which solar power is likely to be the most widely represented. Indeed, in 2013, the GoL issued the “Draft Decree on Solar Energy Development” and supplied home solar systems to around 13,000 households, mostly in remote areas.

**Dynamics between 2005 and 2015**

Between 2005 and 2015, access to electricity improved almost everywhere in the country, except in some areas where not much change was recorded (Map H5.3). The areas that have remained more or less stable in terms of electricity access include parts of Luang Prabang, Phongsaly, Oudomxay, and Luang Namtha in the north, as well as major portions of Savannakhet, Saravane and Sekong in the south. There are isolated cases in which the share of the population with access to electricity decreased. It is likely, that this decrease is only a reflection of population increase coupled with slow or no infrastructure development.

One can also note that the increase in access to electricity during this time period was greater in rural and remote areas, for example in Huaphanh and Xiengkhuang Provinces, than in urban centres where most people already had access to electricity back in 2005.

H5.3: Dynamics in access to electricity

