



# BASELINE ASSESSMENT REPORT SOCIAL AND LIVELIHOODS

Strategic Environmental Assessment of the  
Hydropower Sector in Myanmar

IN PARTNERSHIP WITH:



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## ABBREVIATIONS

CDZ	Central Dry Zone
CEDAW	Convention on the Elimination of all Forms of Discrimination against Women
CFSVA	Comprehensive Food Security and Nutrition Assessment
CSO	Civil society organization
DoA	Department of Agriculture
DRD	Department of Rural Development
ERIA	Economic Research Institute for ASEAN and East Asia
ESE	Electricity Supply Enterprise
FAO	Food and Agriculture Organization
FESR	Framework for Economic and Social Reforms
FESR	Framework for Economic and Social Reforms
FGT	Foster-Greer-Thorbecke
GDP	Gross domestic product
GII	Gender Inequality Index
GMS-EOC	GMS Environment Operations Center
HAI	Human Awareness Institute
ICT	Information and Communications Technology
IDP	Internally Displaced Persons
IGN	Inter-governmental Negotiations
IHLCA	Integrated Household Living Conditions Survey
IHLCS	Integrated Household Living Condition
IHLCS	Integrated Household Living Conditions Survey
ILO	International Labour Organization
JICA	Japan International Cooperation Agency
LDL	Lower decision limit
LIFT	Livelihoods and Food Security Trust Fund
MDG	Millennium Development Goal
MIMU	Myanmar information management unit
MoAI	Agriculture and Irrigation
MOBA	Ministry of Border Affairs
MOE	Ministry of Education
MOEP	Ministry of Electric Power
MOEP	Ministry of Electric Power
MOF	Ministry of Finance
MOH	Ministry of Health
MOLESS	Ministry of Labour, Employment and Social Security
MPI	Multi-dimensional Poverty Index
MP	Member of Parliament
MSWRR	Ministry of Social Welfare, Relief and Resettlement
NCDP	National Comprehensive Development Plan
NLUP	National Land Use Policy
NLUP	National Land Use Policy
OECD	Organisation for Economic Co-operation and Development
OPHI	Oxford Poverty and Human Development Initiative
PSIA	Poverty and Social Impact Assessment
SC	Save the Children
SDG	Sustainable Development Goal
SE	South East
SEA	Strategic Environmental Assessment
SEZ	Special economic zone

SRE	Self-Reliant Electrification Approach
UDL	Upper decision limit
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
UNPF	United Nations Population Fund
WASH	Water, Sanitation and Hygiene
WFP	World Food Programme

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## EXECUTIVE SUMMARY

The aim of social and livelihood baseline report is to provide background information for an enhanced understanding by decision makers and other stakeholders of the range of stakeholder values and priorities that need to be taken into account in formulating the sustainable hydropower development pathway.

Selected policies, plans and priorities for social issues and livelihoods are briefly described. These include: 20-year National Comprehensive Development Plan 2011-2031 (NCDP); Comprehensive Development Vision of 2010-35; 2nd 5-Year National Plan from 2016-17 to 2020-21; Framework for Economic and Social Reforms" (FESR); National Social Protection Strategic Plan; and National Urban System of Myanmar and the Urban Development Prioritization. National Strategic Plan for the Advancement of Women. National Land Use Policy (NLUP).

**Demographics, urbanization, migration** are relevant for hydropower sector planning as they are issues that sets the backdrop for energy demand assessment and broader energy supply planning. By 2040, the population is forecast to be 62.8 million. The annual population growth rate has decreased from 2.1 in 1985 to 0.9 in 2015. The average household size, indicating degree of modernization, is significantly higher in predominantly ethnic minority areas than in Barma dominated areas. Population density, indicating general pressure on, and demand for resources, is significantly lower in predominantly ethnic minority areas. Two million people live outside Myanmar (2014), 70% in Thailand. 1.2 million are men. The largest numbers of emigrants are from Mon, Kayin, Shan, Bago and Rakhine. Employment and search for employment is the main driver of migration. The urban growth rate is at 2.5%, rural growth rate 0% (2015). There is strong rural to urban migration with Yangon and Mandalay being the main centres of attraction. Yangon has 4.7 million people (36% of urban population), while Mandalay has a population of 1.2 million (9%). 40% of the town population live in towns with between 25,000 and 250,000 people and 25% of the town population live in around 100 towns of less than 100,000 people.

**Occupations and livelihoods** are relevant for potential impacts on livelihoods that are directly dependent on rivers and related natural resources. However, Census 2014 aggregate occupations in agriculture, forestry and fishing into one category, and this constrains the analysis of livelihoods that are mainly dependent on river resources. The largest category in Census 2014 data on 'usual activities' of people is 'own account worker' ('self-employed'). A measure of the dependence on rivers for livelihoods is attempted through the proxy indicator of ownership to boats, which was included in the Census 2014.

**Poverty, vulnerability to flooding, food security:** hydropower plants' potential direct impacts on poor people can be significant with both negative and positive effects. The latest nation-wide poverty data from 2010 are sample based not allowing for basin level analysis. The poverty incidence decreased between 2005 and 2010 in all State/Regions, except Chin urban. However, many households fluctuate around the poverty line and temporary, or transitory poverty, affected 28% of all households vs. 10% of all households that are chronically poor between 2005-2010. Transitory poverty is linked to the extensive dependence of the majority of the population on agriculture and natural resources with the associated vulnerability to floods and droughts, storms and diseases. The potential for flood protection measures is an important consideration in Myanmar. Between 1970 and 2016, 12.4 million people were affected by floods; of these 11.2 million were affected by riverine floods in 15 events. Large parts of rural Myanmar are still vulnerable to food insecurity especially caused by natural disasters. About half a million people were in need of food assistance in Myanmar in January 2017. 35% of children under the age of five suffer chronic malnutrition. Vulnerabilities with direct linkages to hydropower development include: storm surge, flood, drought, earthquake and landslides. Other vulnerabilities include under-and malnutrition and trafficking/migration.

**Gender:** hydropower development has different impacts on women and men. In other areas of SE Asia women are the primary collectors of aquatic animals and plants and users of riverbank gardens, however for Myanmar comprehensive data on this are not available, but studies have found that

women are most affected by hunger and food insecurity. There is a widespread lack of awareness of the relevance of gender issues. Access to “modern” influences through mobiles and social media is challenging traditional gender roles. Also changing work environments requiring greater flexibility and mobility impact on gender roles.

**Ethnic minority groups** are a key element of hydropower planning in Myanmar as most of the planned hydropower is located in ethnic minority nationalities’ areas. The National Land Use Policy (NLUP) 2016 is a key new document for the rights of ethnic groups with regard to securing and protecting their land rights. According to the policy customary land use tenure systems shall be recognized in the National Land Law. However, doubts are expressed by several stakeholders as to whether key rights elements will be retained through the legislative process and implementation of the policy.

**Cultural values** must be factored in when thinking strategically about utilization and changing specific natural landscapes through hydropower. While maps of some river basins showing a small number of cultural sites of importance were produced by stakeholders through the SEA consultation process, a comprehensive inventory allowing for inclusion in the analysis has not been available.

**Access to services** is a contributing factor to resilience to threats to existing livelihoods and to changing life circumstances in general. This scope of this report limits to look at access to electricity as hydropower is about electricity, and access to ICT as a proxy indicator for the significant social and cultural changes that occur and will continue in Myanmar over the next decades.

**Limitations and gaps** in the analysis include lack of high-resolution statistical data, i.e., Census data at the Village or Village Tract level, and further, data on livelihoods and occupations that are directly or indirectly dependent the use of rivers and inland water bodies. Time series of most socio-economic variables, including on poverty have not been available. Data limitations affects the vulnerability, sensitivity and sustainability analysis and issues related to this will be discussed with stakeholders and advisory groups.

An Annex contains supporting data in tables, reference to these is made throughout the report.

# 1 SCOPE OF THE SOCIAL AND LIVELIHOODS THEME

The aim of social and livelihood baseline report is to provide background information for an enhanced understanding by decision makers and other stakeholders of the range of stakeholder values and priorities that need to be taken into account in formulating the sustainable hydropower development pathway. The themes covered in the SEA and their relevance for hydropower development are described in the following:

**Demography:** includes population and population growth, population density, migration, and urbanization. Demography is relevant for hydropower development because it sets the backdrop for energy demand assessment and broader energy supply planning.

**Occupations and livelihoods:** includes occupations by State/Region based on Census 2014; data on inland fisheries as livelihood; proxy indicator for dependency on rivers; qualitative assessment of current trends in livelihoods. Occupations and livelihoods are relevant for the SEA of hydropower in terms of assessing potential impacts on livelihoods that are directly dependent on rivers and related natural resources (which however is not possible due to lack of data), and benefits such as opportunities for alternative livelihoods. This theme gives a backdrop to long-term development issues.

**Poverty and vulnerability:** includes poverty by State/Region based on IHLCA 2010. Poverty is relevant for hydropower development in terms of assessing the latter's effect on poverty reduction. The distribution of poverty across the country is important in the context of locations of hydropower plants and their potential direct impacts on poor people. Vulnerability includes impacts of flooding on livelihoods since hydropower development can have direct links to flooding in terms of potential for flood protection measures, flooding caused by deforestation that also impacts on hydropower, and the risk of flooding due to inadequate operation of hydropower dams.

**Gender:** includes general gender issues: change in fertility rate number and distribution of female-headed households, role of women in inland fisheries and use of natural resources. Gender aspects are relevant in all development assessments. Specifically relevant for hydropower, it is known that in other areas in SE Asia women are the primary collectors of aquatic animals and plants and users of riverbank gardens. In Myanmar women's rights are in the process of being secured through legislation.

**Ethnic groups:** includes description of the main ethnic groups, and map of their spatial distribution. In Myanmar the rights, livelihoods and culture of ethnic groups, or ethnic nationalities, are one of the most important components of all strategic development plans. Most of the planned hydropower is located in ethnic nationalities' areas.

**Access to services:** maps and tables of access to electricity, use of other sources of lighting, and ownership to ICT assets based on Census 2014. This is relevant for the SEA because hydropower benefits should include increased access to public services, not least electricity. The rapidly increasing increase in access to ICT is considered to be a key factor for the development in governance and politics in Myanmar. In vulnerability assessment context access to services is a contributing factor to resilience to threats to existing livelihoods and to changing life circumstances in general.

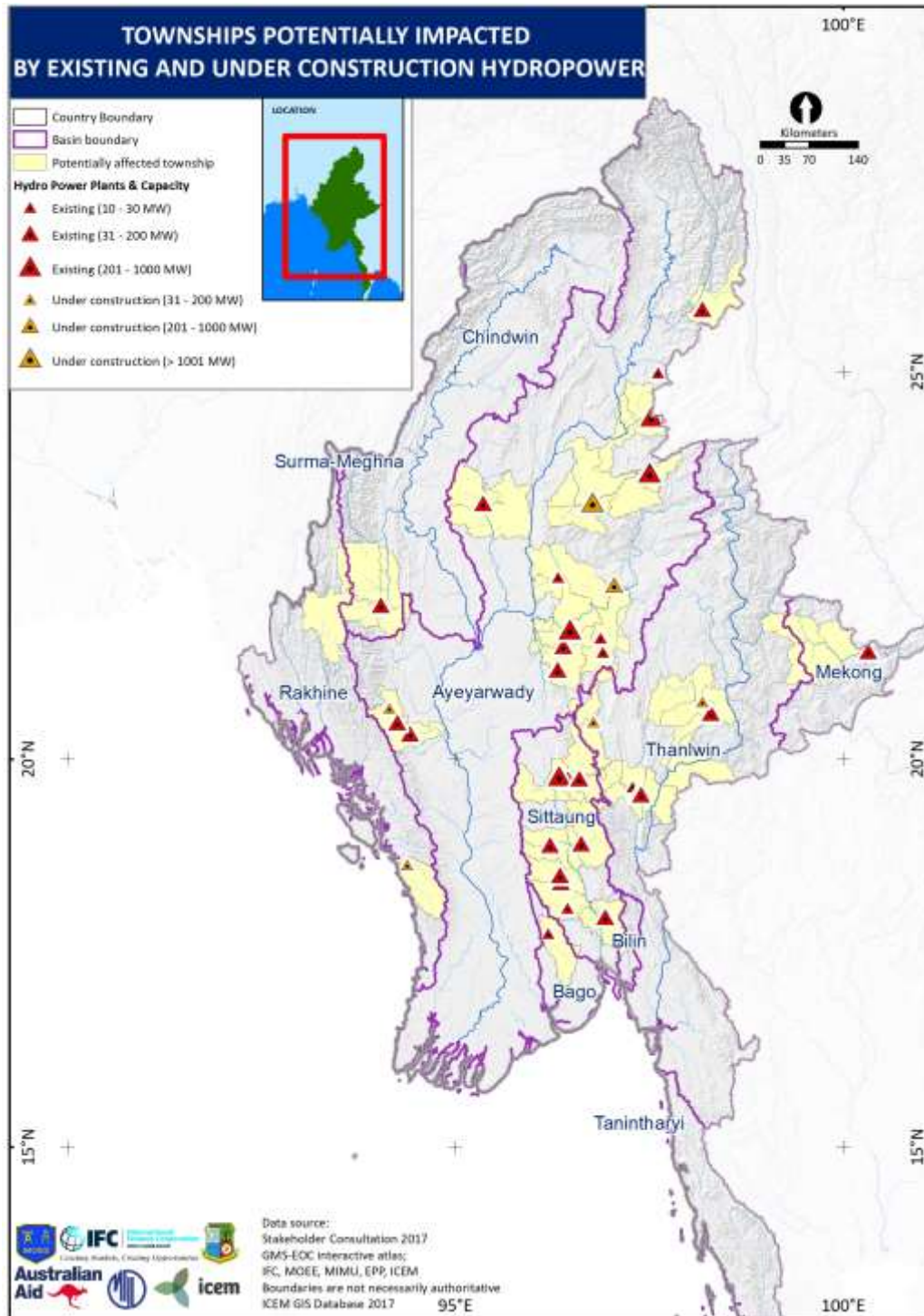
**Cultural values:** cultural and religious values linked to rivers. This is relevant to the SEA as non-material values are very important for many people and must be factored in when thinking strategically about utilization and changing specific natural landscapes. There is not much documented knowledge about these values in Myanmar.

**The geographical scope of the analysis** is national, State/Region and township level (Figure 1.1). The temporal scope is constrained by the lack of time series data except on a few variables. The study relies heavily on data from Census 2014.

The social and livelihoods aspects have strong linkages to the economic, fisheries and aquatic ecology and conflict themes, and linkages to all other themes to the degree they include impacts on people and livelihoods.

The analysis is data driven so that statistical data are presented for the spatial unit for which they are available and valid, e.g. at State/Region for population growth, migration; occupations and poverty data; at township level for number and percentage of female-headed households; and access to services.

Figure 1.1: Townships potentially impacted by existing and under construction hydropower with major basins



Two main data sources for the social and livelihoods baseline assessment are:

- Census 2014<sup>1</sup>: selected variables from MIMU, at Township level and from the printed report, at State/Region/Division level; and
- Integrated Household Living Conditions Survey (IHLCS) 2011.

There is a vast amount of recent (i.e., from 2008 to 2017) literature on social and livelihood aspects of development in Myanmar, but little reference specifically to hydropower. What is available is cited and referenced in this chapter.

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<sup>1</sup> Census 2014

## 2 GOVERNMENT POLICY, PLANS AND PRIORITIES

### 2.1 National economic development policies and plans

The following key policy and strategy documents describe the overall development framework for Myanmar:

**20-year National Comprehensive Development Plan 2011-2031 (NCDP):** developed by the government in partnership with UNDP, ADB and the Economic Research Institute for ASEAN and East Asia (ERIA). The NCDP aims at increasing the country's GDP to US\$180 billion in 2030-31 and its per capita GDP to \$3,000.

**Comprehensive Development Vision of 2010-35:** This was developed with the help of the ERIA and its Industrial Development Vision in partnership with the Japan International Cooperation Agency (JICA). It promotes a "two-polar growth strategy" and border development with enhancement of connectivity linked to spatially targeted investment, including physical and institutional infrastructure, in Yangon, Mandalay and some border areas. Also, the establishment of special economic zones (SEZs) to promote industrial clusters in the targeted areas is envisaged.

**2<sup>nd</sup> 5-Year National Plan from 2016-17 to 2020-21:** The plan is still in the political process. It aims at boosting economic growth by encouraging investments in the public and private sectors to ensure higher local productivity through industrialization.

The government's central policy is 'people centred development', and a reform strategy based on 'bottom-up approach'.

### 2.2 Framework for Economic and Social Reforms (FESR)<sup>2,3</sup>

The "Framework for Economic and Social Reforms" (FESR) was launched in 2013. FESR identified the following four areas of policy priorities:

- Sustained industrial development to catch up with global economies while keeping up the momentum of agricultural reforms and attaining poverty alleviation and rural development;
- Equitable sharing of resources, both budgetary and foreign aid, among regions and states while promoting foreign and local investments for regional development;
- Effective implementation of people-centred development through community-driven, participatory approaches to improvements in education, health and living standards;
- Reliable and accurate gathering of statistical data and other information to better inform public policy decisions.

The FESR program for the Poverty Reduction comprised the following eight aims: Development of (i) Agricultural productivity; (ii) Livestock breeding and fisheries; (iii) Rural small-scale productivity; (iv) Micro saving and credit associations; (v) Cooperative tasks; (vi) Rural socio-economy; (vii) Rural energy and (viii) Environmental conservation.

The following priority areas have later been identified by the government: (i) Electricity; (ii) Water Supply; (iii) Agriculture development; (iv) Employment Creation; (v) Tourism Development; (vi) Financial Services and (vii) Trade and Investment.

While FESR referred to and incorporated the Millennium Development Goals (MDGs)<sup>4</sup> in the strategic priorities, the government has worked to incorporate the SDGs into sector strategies and plans since 2015. Seventeen Sector Working Groups have been created to build shared trust and

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<sup>2</sup> Presentation by Myanmar Representative UNHQ, New York, 24-3-2015, Inter-governmental Negotiations on the post 2015 development agenda (IGN)). (2015). [online] Available at: <https://sustainabledevelopment.un.org/content/documents/13304myanmarpresenation.pdf>.

<sup>3</sup> Framework for Economic and Social Reforms. Policy Priorities for 2012-15 towards the Long-Term Goals of the National Comprehensive Development Plan. (2012). [online] Government of Myanmar. Available at: <https://www.scribd.com/document/263964163/FESR-Official-Version-Green-Cover>.

<sup>4</sup> The Millennium Development Goals (MDGs) are the world's time-bound and quantified targets for addressing extreme poverty in its many dimensions-income poverty, hunger, disease, lack of adequate shelter, and exclusion-while promoting gender equality, education, and environmental sustainability. <http://www.un.org/millenniumgoals/>



enhance co-ordination. There are on-going efforts to mainstream environment into national and sectoral development process to achieve the Sustainable Development Goals (SDGs).<sup>5</sup>

### 2.3 National Social Protection Strategic Plan

Myanmar National Social Protection Strategic Plan was launched in December 2014.<sup>6</sup> Social protection in Myanmar is defined as including “policies, legal instruments and programmes for individuals and households that prevent and alleviate economic and social vulnerabilities, promote access to essential services and infrastructure and economic opportunity, and facilitate the ability to better manage and cope with shocks that arise from humanitarian emergencies and/or sudden loss of income.”

The plan addresses four dimensions of social protection: protective social protection; preventive social protection; promotive social protection; and transformative social protection. The last part focuses on equity and social cohesion along with socio-economic development.

The plan has a strong element of disaster risk management, which is linked to public employment programmes. This element has links to hydropower development through its prioritization of disasters resilient infrastructure and for example, hydropower’s potential for flood prevention. The stated aim is to:

*(i) increase the resilience of communities to disasters and climate change through prioritization of disaster resilient infrastructure and assets; and (ii) to enhance recovery efforts after a disaster (debris and environmental cleaning, rehabilitation of essential infrastructure, construction of WASH facilities, road rehabilitation, support to drinking water distribution, etc.).*

*Public employment criteria will be introduced that include: (i) the contribution to environmental conservation; (ii) the contribution to increasing resilience of communities to disasters; (iii) the need to make essential infrastructure disaster proof; and adaption of the criteria and evaluation of projects to the local context and the specific hazards/ environmental concerns that can be observed in the area of implementation.*

With regard to public employment programmes the time schedule for the plan is to operationalize these during 2015, however the status at present in 2017 is not known.

### 2.4 Rural Development Strategic Framework<sup>7</sup>

It is stated that the government has set up a development goal to reduce poverty to from 26% to 15% nationwide within 30 months. In this context the rural development policy is: “*To reduce poverty with the emergence of a good governance process for progressive rural development by setting up and implementing most suitable self help village development projects in a timely manner for the people who are in real need of help from special (priority) regions by means of implementing regular socioeconomic development activities throughout the whole nation and organizing technology, expertise, capitals and development funds as well; by conducting their activities in harmony with special all round central area development services for different sectors in the respective regions*”.

The criteria for selecting areas of priority for support are (i) development need - poverty incidence; (ii) beneficiary coverage - expected benefits, population density; (iii) operational feasibility - including cooperation and connections of local people; (iv) social equity - including equity between ethnic groups; (v) visibility for replicability - areas easily accessible so multiplication of impacts can be achieved; (vi) synergy of development intervention and multiplying impacts - including participatory village development plans.

### 2.5 Urban development<sup>8,9</sup>

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<sup>5</sup> The Sustainable Development Goals (SDGs), otherwise known as the Global Goals, are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity. <https://sustainabledevelopment.un.org/topics/sustainabledevelopmentgoals>

<sup>6</sup> The Republic of The Union of Myanmar, (2014). *Myanmar National Social Protection Strategic Plan*. [online] The Republic of The Union of Myanmar. Available at: <http://themimu.info/node/21180>.

<sup>7</sup> This review is based on ‘Rural Development Strategy for Poverty Reduction Concept Note (5th Draft)’ - the final document is not available for download.

The priorities set in the ‘National Urban System of Myanmar and the Urban Development Prioritization’ are the following: (i) Importance for the National Unity; (ii) Importance for Regional Socio-Economic Development; (iii) Importance for Economy, Border Trade, Special Economic Zone Development Potential; (iv) Historical and Cultural Importance and (v) Tourism Development Potential. Figure 2.1 shows the ‘concept of concentrated decentralization development strategy’ for regional spatial and urban planning. Figure 2.2 shows the plans for overall national zone planning and transport linkages.

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<sup>8</sup> Oo, H. (2013). Infrastructure and Urban System Development in Myanmar. Prepared for e-ASIA Joint Research Program: Workshop on “Intelligent Infrastructure”, Yangon Technological University, Yangon, Myanmar. 2<sup>nd</sup> to 4<sup>th</sup> December 2013. By Hlaing Maw Oo (alias) Maw Oo Hock Deputy Chief Architect / Senior Urban Planner, Public Works / Department of Human Settlement and Housing Development, Ministry of Construction. 2013.

<sup>9</sup> Asian Development Bank, (2013). *Myanmar: Urban development and water sector assessment, strategy, and road map*. Mandaluyong City, Philippines: Asian Development Bank.

Figure 2.1: Concentrated Decentralization Development Strategy

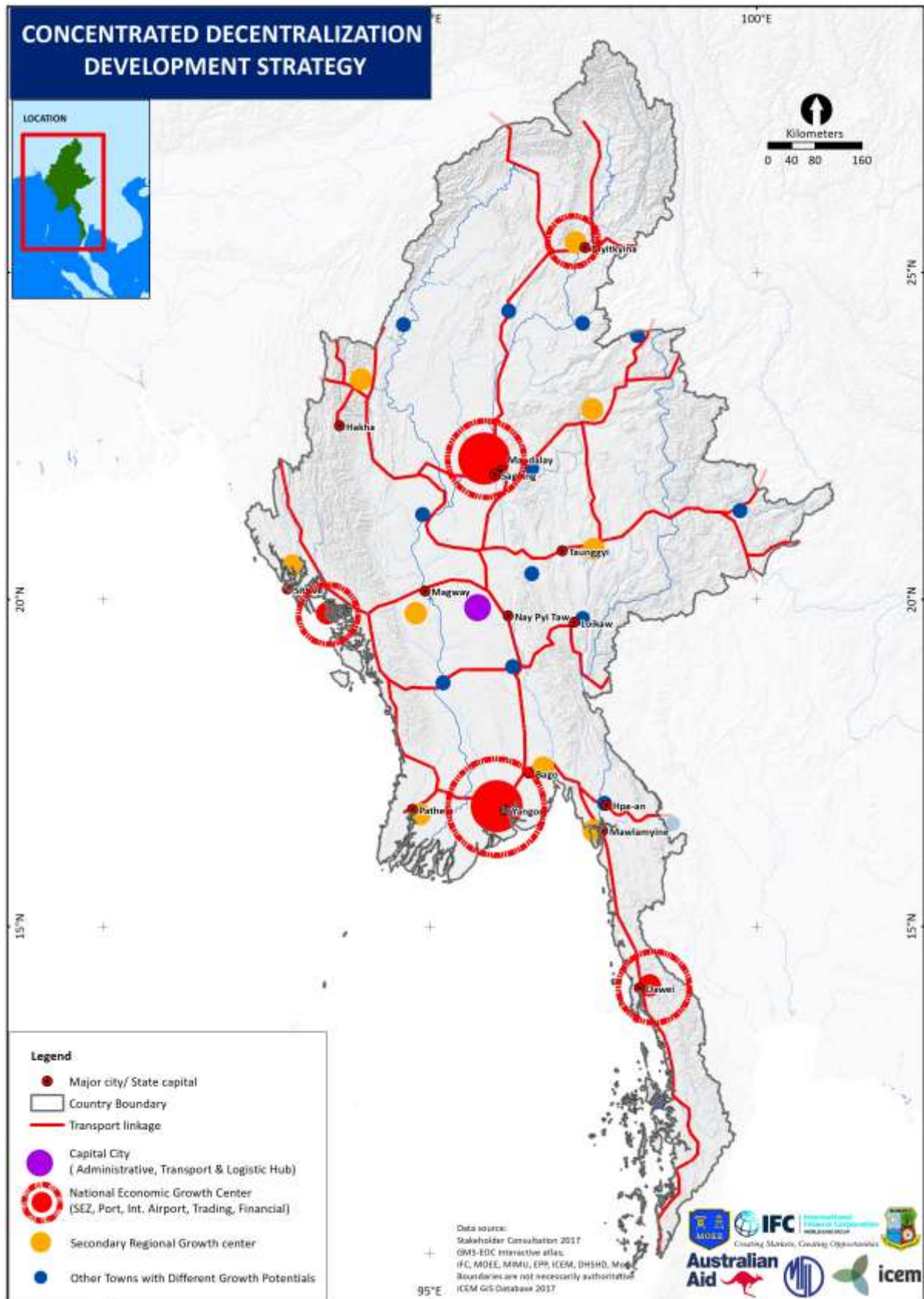
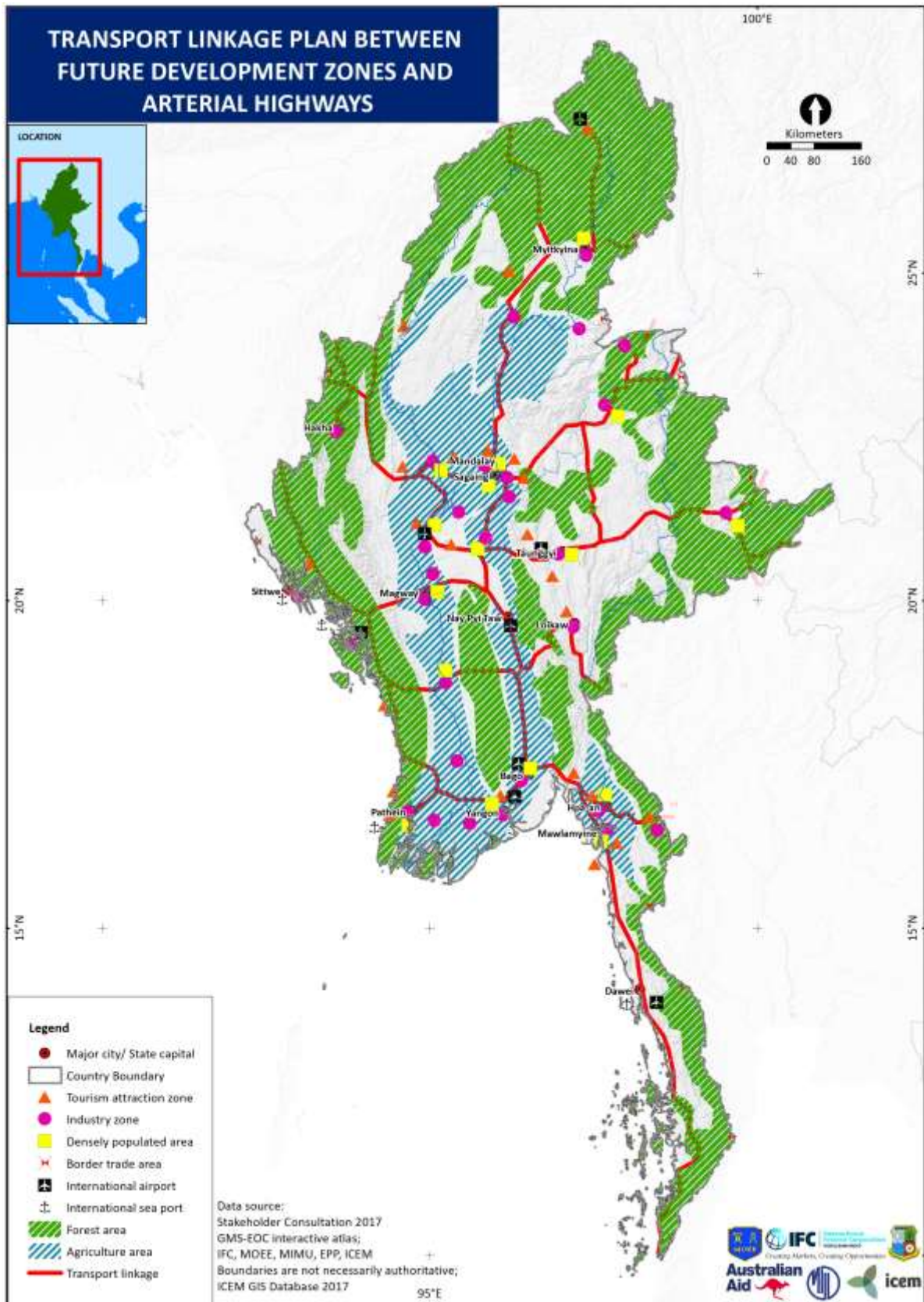


Figure 2.2: Plans for overall national zone planning and transport linkages





## 2.6 Gender equality<sup>10</sup>

The government has expressed its commitment to CEDAW (Convention on the Elimination of all Forms of Discrimination Against Women). A dedicated Gender Equality & Women's Empowerment Sector Working Group has been established, and a National Strategic Plan for the Advancement of Women (2013-2022) was launched in 2013. The comprehensive plan includes, among others, a priority area for women and livelihoods that will be implemented through "Practical initiatives supported by designated focal Ministries that focus on social protection mechanisms for women, new livelihoods programmes for women living in poverty, and equal treatment in land and agrarian reforms." For the priority area of women in the economy implementation will comprise "Practical initiatives supported by designated focal Ministries that focus on livelihood initiatives that: provide equal access to employment and resources; promote balance between household work and income generation; promote quota systems for women in economic management; implement workplace policies about equal pay for equal work and non-harassment".

**Gender equality in Land Use Policy:** The National Land Use Policy (NLUP) 2016<sup>11</sup> has as one of the basic principles "To ensure equal opportunities for men and women over land resources, tenure rights and participatory decision making". Thus, the policy states that "men and women have the following land tenure and management rights equally: (a) The right to hold individual or joint landholder rights and the right to own property; (b) The right to land allocation and land management in accordance with law; (c) The right to inherit land tenure and management rights; (d) The right to land tenure and management rights when a spouse dies, when property is divided and when couples divorce; (e) The right to participate and represent the community when making decisions in land disputes relating to land use, land transfer and land succession rights, including customary practices and systems of ethnic nationalities; (f) The right to participate and represent the community in relation to land acquisition, compensation, relocation, rehabilitation and restitution; (g) The right to participate in land information collection, land monitoring, land evaluation and land assessment; (h) The right of ethnic nationality organization members to formally recognize, register and protect their customary land use rights, regardless of marital status". Provided the policy results in a law that is implemented and enforced it is an important step towards gender equality in Myanmar. The policy's gender equality focus can have direct implications for hydropower development in cases where land could be expropriated and for resettlement.

A law banning violence against women is in final draft form dated December 2016. In 2015, The Myanmar Buddhist Women's Special Marriage Law<sup>12</sup> was passed, which places some restrictions on the marriage of Buddhist women and men of other faiths. The law has drawn strong criticism nationally and internationally.

## 2.7 Land use rights of Ethnic Groups

The National Land Use Policy (NLUP) 2016 is also a key new document for the rights of ethnic groups with regard to securing and protecting their land rights. The policy specifies the content of a law to be drafted that would have direct implications for hydropower development in cases where land could be expropriated and for resettlement. The policy states that "Customary land use tenure systems shall be recognized in the National Land Law in order to ensure awareness, compliance and application of traditional land use practices of ethnic nationalities, formal recognition of customary land use rights, protection of these rights and application of readily available impartial dispute resolution mechanisms".

Furthermore, the responsible government departments and organizations when preparing and revising customary land use maps and records of ethnic nationalities, shall "(b) Formally recognize and protect the customary land tenure rights and related local customary land management practices of ethnic

<sup>10</sup> Myanmar National Committee for Women's Affairs, (2013). *National Strategic Plan for the Advancement of Women 2013 – 2022*. Ministry of Social Welfare, Relief and Resettlement, Myanmar. Available at: [http://myanmar.unfpa.org/sites/asiapacific/files/public/NSPA2013-2022\\_0.pdf](http://myanmar.unfpa.org/sites/asiapacific/files/public/NSPA2013-2022_0.pdf)

<sup>11</sup> The Republic of the Union of Myanmar, (2016). *National Land Use Policy*. Available online at: <http://extwprlegs1.fao.org/docs/pdf/mya152783.pdf>

<sup>12</sup> The Myanmar Buddhist Women's Special Marriage Law (draft) Unofficial translation. (2014). [online] Available at: [http://www.burmalibrary.org/docs21/2015-Myanmar\\_Buddhist\\_Women\\_Special\\_Marriage\\_Bill.pdf](http://www.burmalibrary.org/docs21/2015-Myanmar_Buddhist_Women_Special_Marriage_Bill.pdf) [Accessed 20 Feb. 2017].

groups, whether or not existing land use is registered, recorded or mapped; (c) Recognize the rights of stakeholders who are members of ethnic nationality organizations, and recognize in existing laws in order to register their land use". The last point is an acknowledgement of the rights of groups to jointly used land.

Regarding protection against grants or leasing of land at the disposal of the government, the policy states:<sup>69</sup> "Provision in the new National Land Law relating to reclassification of customary land and land tenure right of ethnic groups shall be the protection against grants or leasing of land at the disposal of government allowed under any existing law."<sup>70</sup> Reclassification, formal recognition and registration of customary land use rights relating to rotating and shifting cultivation that exists in farmland, forestland, vacant land, fallow land, or virgin land shall be recognized in the new National Land Law. <sup>71</sup> Technical, financial and infrastructure support shall be made available to improve the land tenure security and agricultural practices of ethnic nationalities, in order to protect the environment, increase climate change resilience, and improve their food security." Further analysis on ethnic minority groups is provided in the Conflict chapter.

## **2.8 Limitations and gaps in existing information and analysis**

High-resolution statistical data, i.e., Census data at the Village or Village Tract level, has not been available for the present analysis, only data at Township level. Since Townships in many cases crosses river basin boundaries, this makes data analysis and aggregation of data at basin level with a degree of error (size of which has not been calculated). Therefore, the approach has been to use Township level data, which also conforms to advice from the SEA Advisory Group.

For impact assessment, it is a source of error and uncertainty that Townships are relatively large, while direct impacts from hydropower plants are primarily limited to corridors around the affected rivers. Thus, using Township level for impact assessment is prone to bias towards overestimation of the number of people exposed to potential impacts from hydropower.

Data on livelihoods and occupations that are directly or indirectly dependent the use of rivers and inland water bodies are lacking. Thus it has not been possible to assess the scale of potential impacts on these livelihoods.

The Census 2014 was the first in thirty years. It is noted that: "an estimated total of 1,206,353 people were not enumerated in parts of Rakhine State, Kachin State and Kayin State. This represents 2.34 percent of the population. These numbers were added to the overall census population as reported in the provisional results and they have also been included in the main results in the Census publication. However, the analysis and presentation of the detailed information of the 2014 Census is based on data provided by the enumerated population only."

Time series of most socio-economic variables, including on poverty are not available.

How to work with these data limitations in the vulnerability, sensitivity and sustainability analysis will be discussed with stakeholders and advisory groups.

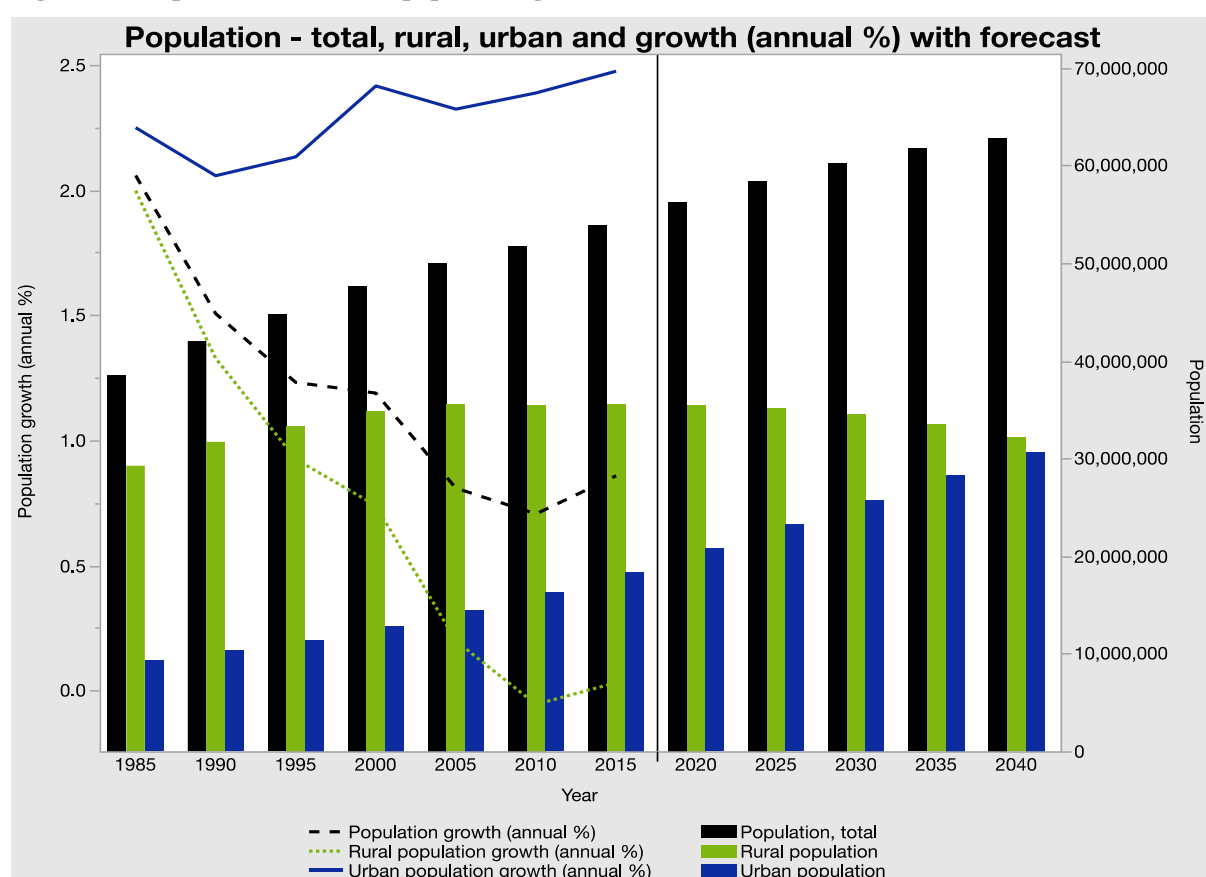


### 3 DEMOGRAPHY

According to Census 2014<sup>13</sup>, the total population of Myanmar is 51.4 million people. Figure 3.1 provides a time series of population growth. The Census shows a slightly higher population figure for 2014. By 2040, the forecast is a total population of 62.8 million.

The rural population is at 70% of the total population, but the percentage has been decreasing and this is most likely to continue over the coming decades. By 2040, the rural and urban population will be almost equal. The annual population growth rate has decreased from 2.1 in 1985 to 0.9 in 2015. However, the urban growth rate has increased over the past 30 years and is now at 2.5%, much higher than the rural growth rate of 0% in 2015. This indicates strong rural to urban migration.

Figure 3.1: Population 1985-2015, population growth rates and forecast



Source: World Bank<sup>14</sup>

#### 3.1 Birth, death and natural growth rate

The birth rate is the number of children born every year per 1,000 people (crude birth rate). The death rate indicates the number of deaths occurring during the year, per 1,000 people (crude) estimated at midyear. Using World Bank time series data on birth rate to forecast, it appears that the decreasing trend over the past 5 decades is likely to continue from the present level of around 17 births per 1,000 population per year to 10 (Figure 3.2). The death rate has also decreased, but flattening out and is forecast to reach a stable level of around 7 deaths per 1,000 population per year (Figure 3.2 and Figure 3.3).

<sup>13</sup> Department of Population Ministry of Immigration and Population, (2015). *The 2014 Myanmar Population and Housing Census, The Union Report, Census Report Volume 2*. Nay Pyi Taw: Department of Population Ministry of Immigration and Population, The Republic of The Union of Myanmar.

<sup>14</sup> Health Nutrition and Population Statistics: Population estimates and projections| World DataBank. (2017). [online] Data-bank.worldbank.org. Available at: <http://databank.worldbank.org/data/reports.aspx?source=health-nutrition-and-population-statistics:-population-estimates-and-projections&Type=TABLE&preview=on#>.

Figure 3.2: Birth rate 1960-2014 and forecast

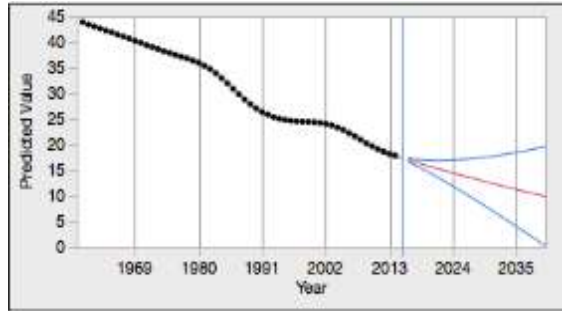
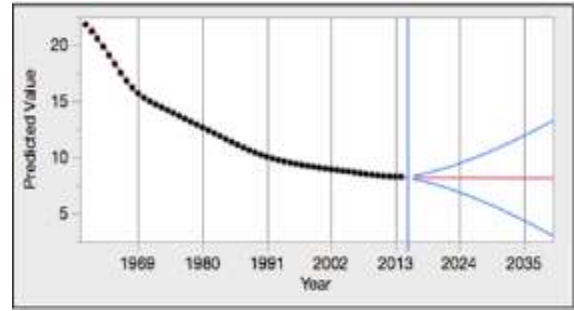


Figure 3.3: Death rate 1960-2014 and forecast



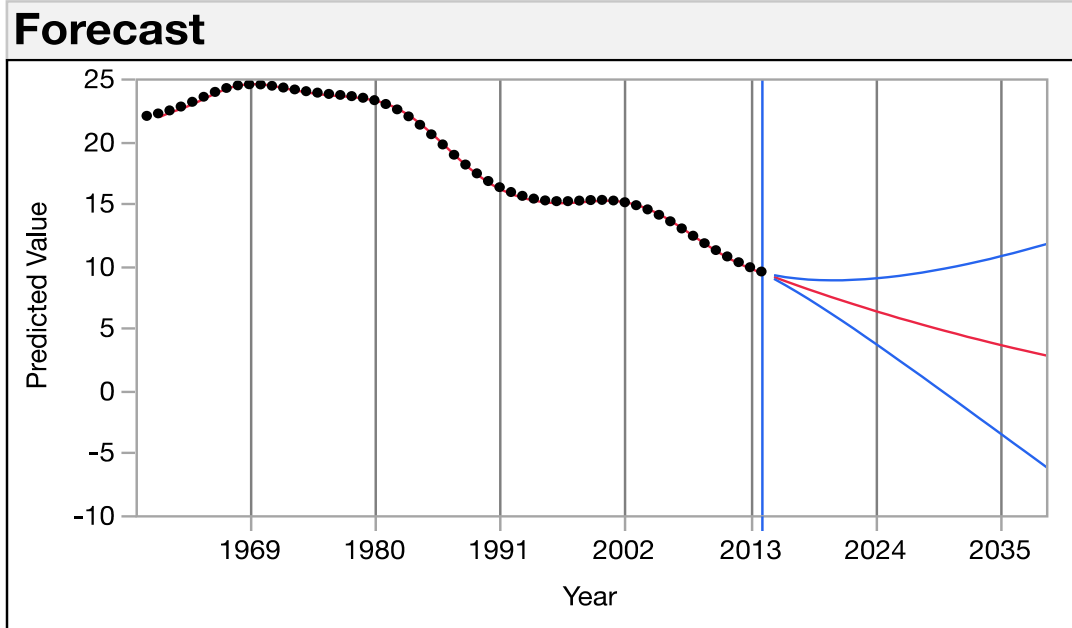
Data source: World Bank data (See Annex for details). Note: red line is the prediction line; blue lines indicate 0.95 confidence intervals.

Subtracting the crude death rate from the crude birth rate provides the rate of natural increase (Figure 3.4), which is equal to the rate of population change without considering migration. The natural population change rate has gone from 25 in 1969 to just below 10 in 2014. The forecast is that the decrease will continue, even with a possibility of a negative growth rate in 2035.

Figure 3.4: Natural population growth rate without migration 1960-2014 and forecast

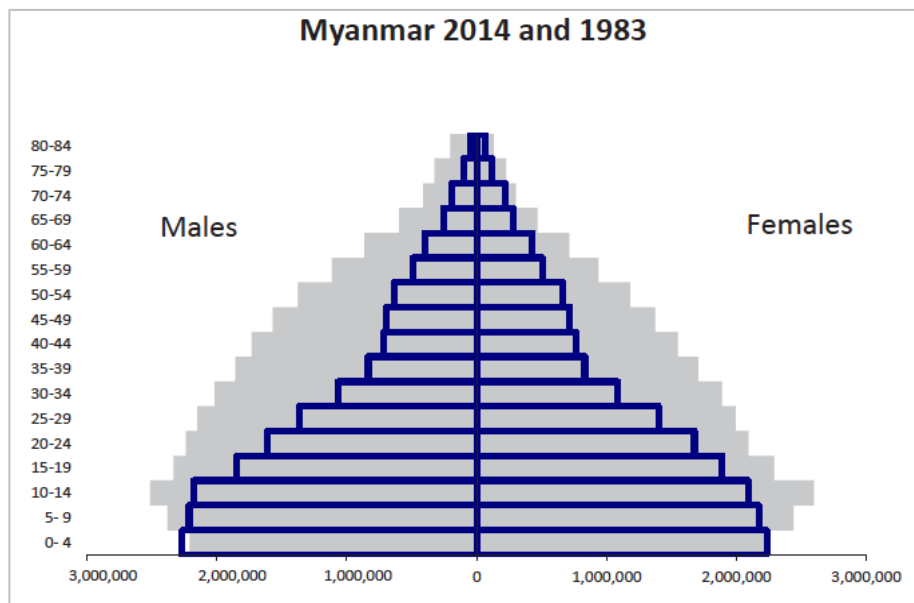
## Time Series Natural increase (without migration)

### Model: Damped-Trend Linear Exponential Smoothing



The population age and sex pyramid in 2014 was more pot-shaped than the broader bottom base pyramid in 1983 (Figure 3.5, grey pyramid is 2014), which is evidence that Myanmar, as most countries, is in a demographic transition. There are more females in the age brackets from 15 years of age and up, while more boys under 15 years of age.

Figure 3.5: Population pyramids 2014 and 1983 compared

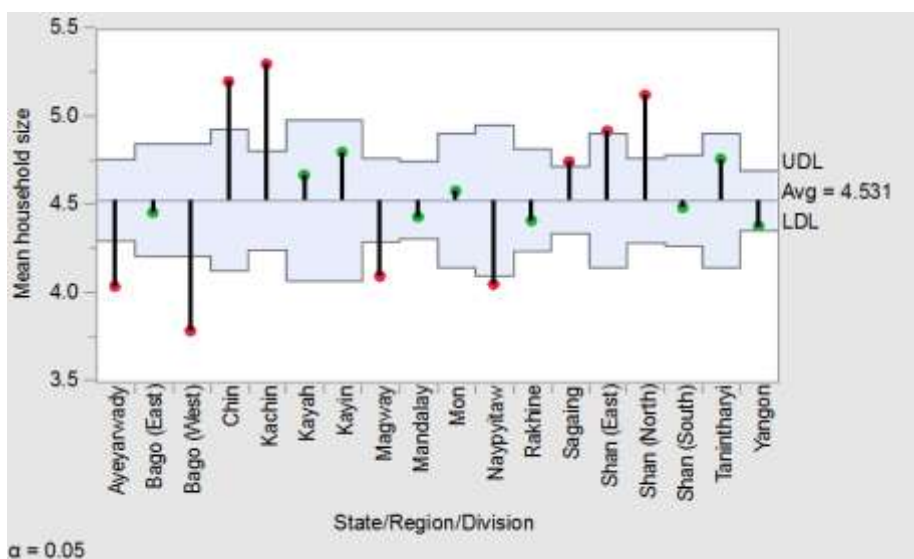


Source: Census 2014, Main Report

### 3.2 Household size

Household size is an indicator of family structures and of degree of development or modernization. Roughly, the lower is the average household size, the more developed is a country. In 2014 the mean household size was 4.53 persons, with a median of 4.4 household members (median of Township mean) (compare to India 4.13 (2012), Thailand 3.08 (2012) Malaysia 4.25 (2012), Philippines 4.5 (2012))<sup>15</sup>.

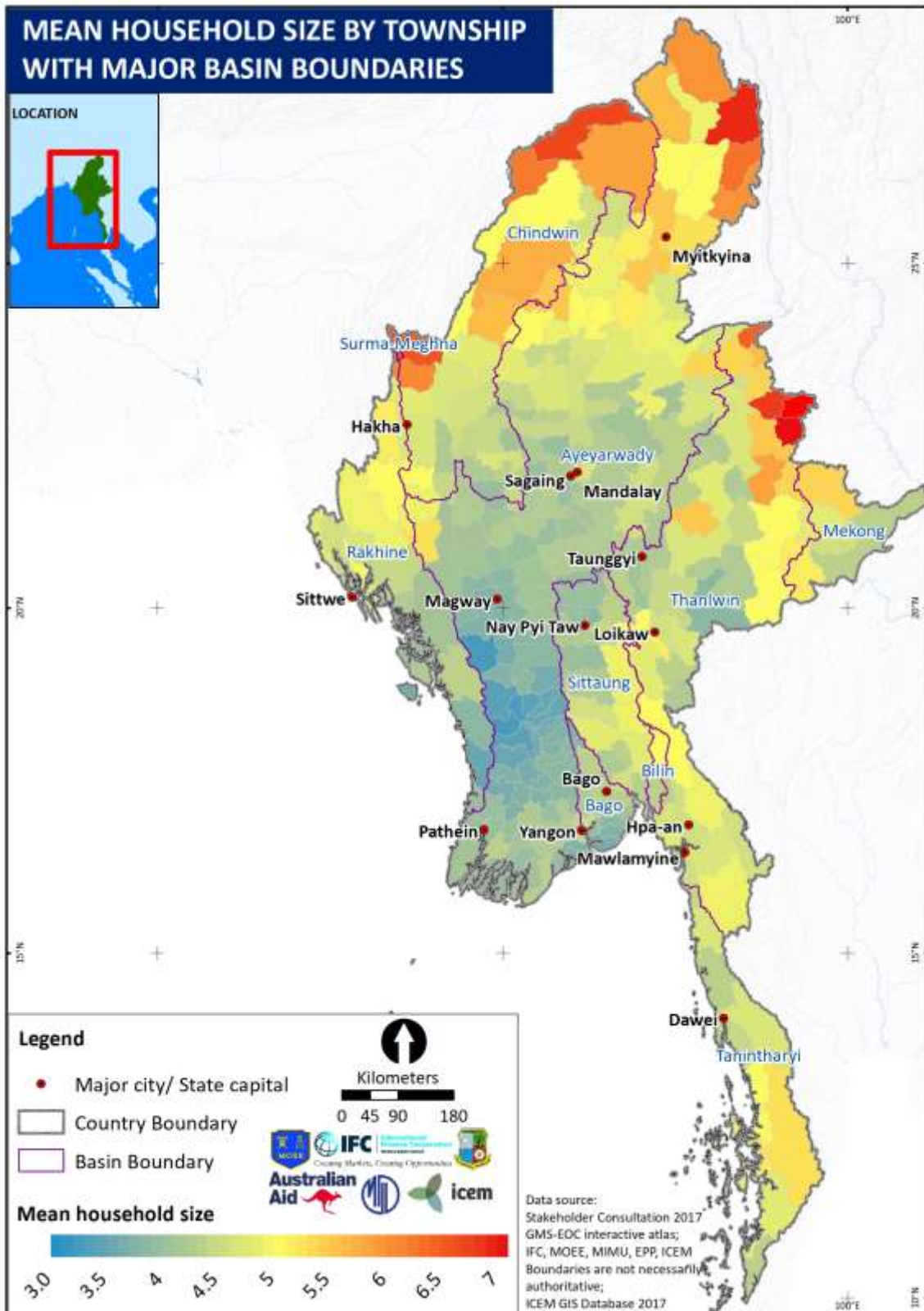
Figure 3.6: Analysis of mean household sizes by State/Region/Division



<sup>15</sup> Households: Average household size (68 countries). (2017). [online] TekCarta. Available at: <https://www.nakono.com/tekcarta/databank/households-average-household-size/> Note: There are a number of key sources (detailed below) for this data but, where possible, this has been supplemented by country-specific sources of data, particularly where data is available from the most recent census carried out in a country. UN Global Urban Observatory Projections <http://ww2.unhabitat.org/habrdd/CONTENTS.html>. UN-ECE [http://w3.unece.org/pxweb/database/STAT/30-GE/02-Families\\_households/?lang=1](http://w3.unece.org/pxweb/database/STAT/30-GE/02-Families_households/?lang=1). EUROSTAT [http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc\\_lvph01&lang=en](http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_lvph01&lang=en). World Bank <http://data.worldbank.org/sites/default/files/wdi-2012-ebook.pdf>. Measure Demographic and Health Surveys <http://www.measuredhs.com/>

However, there are large and statistically significant variations in mean household size across the country (Figure 3.6, Figure 3.7). In Kachin, Sagaing, Chin, Shan North and East, the average household size is significantly higher than in the central State, Regions and Divisions of Ayeyarwady, Bago West, and Magway. Analysis of mean household size by areas mainly inhabited by ethnic groups other than Barma shows that all except one of the ethnic groups have higher household sizes than the Barma.

Figure 3.7: Mean household size by Township with Major Basin boundaries

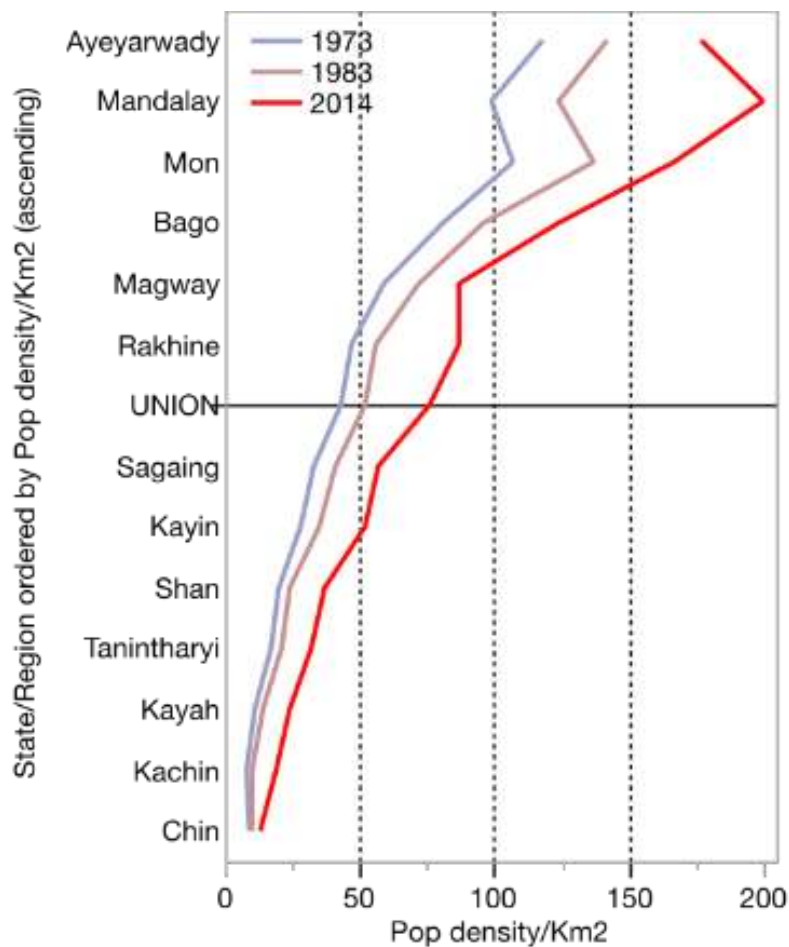


### 3.3 Population density

Population density and the spatial distribution of people are important variables in a SEA because people are both a pressure on the environment and a driver for land use changes such as in agricultural intensification, and not least urbanization (as discussed in the next section). Population density and location is also relevant when broadly assessing and optimizing location of potential sites for hydropower.

In 2014, the national population density was 76 persons per km<sup>2</sup>. This is an increase from 43 persons in 1973 (Figure 3.8). Population density has always varied significantly between the State/Regions. For example, in 1973 population density was 8 persons/km<sup>2</sup> in Kachin and 118 in Ayeyarwady; in 2014, 13 persons/km<sup>2</sup> in Chin and 200 persons/km<sup>2</sup> in Mandalay Region. Between 1973 and 1983 the differences remained stable, but during the period 1983 to 2014 population density in Mandalay, Rakhine and Ayeyarwady has increased relatively more than in other State/Regions (Figure 3.8). The population density at Township level with the boundaries of major basins overlaid is shown in Figure 3.9.

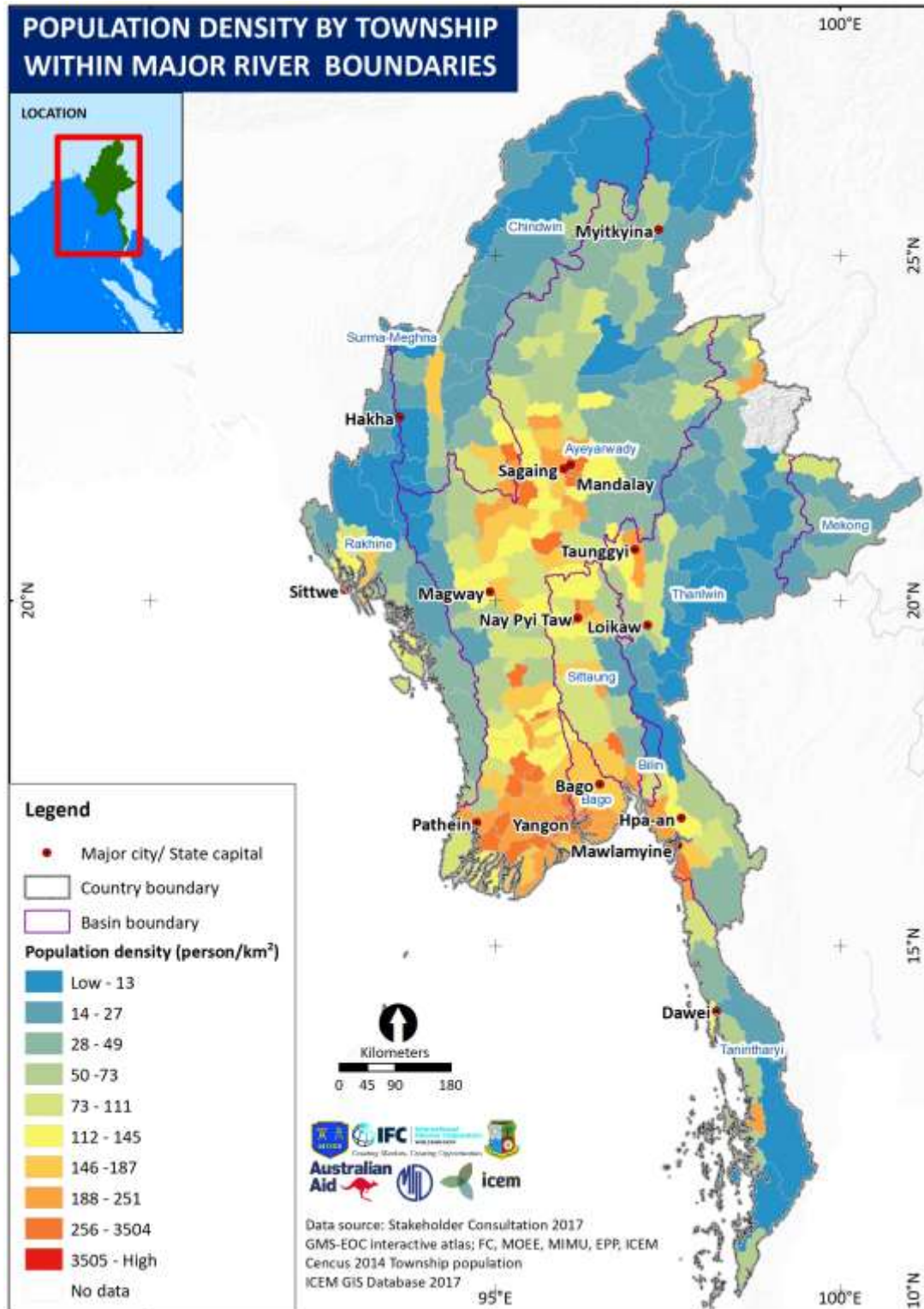
Figure 3.8: Population density 1973, 1983, and 2014 by State/Region



Data source: Census 2014, excl. Yangon and Nay Pyi Taw



Figure 3.9: Population density by Township within major river basins



Data Source: Census 2014 Township population fitted to GIS layers, Township area calculation in GIS. No data for 4 Townships in Northern Shan.

In addition to showing Township population densities, Figure 3.9 illustrates that many Townships cross two, and a few even three major river basins. This produces some uncertainty in statistics when calculating population density for the major basins on the basis of Township data.

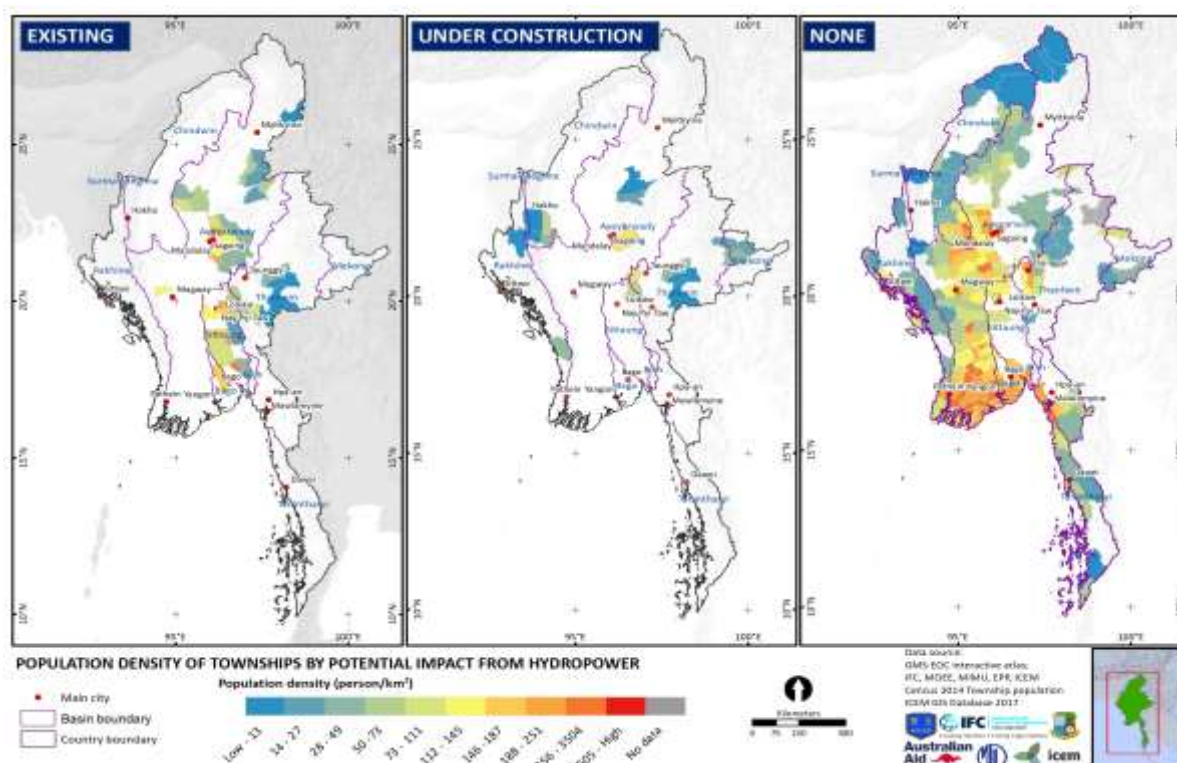
Table 3.1 shows the number of Townships fully inside a major basin and the number of Townships that cross basin boundaries (the latter are treated as belonging to the major basin indicated).



The population densities vary significantly within basins. Thus, though the major basins are the optimal level for strategic planning of hydropower the available demographic and socio-economic data are for Township level and this yields a significant statistical uncertainty in basin level aggregations as discussed above. At the time of the SEA baseline assessment, the Census data for village tracts were not available. Even so when that variation of density across a township was taken into account, the analysis provides a valuable initial foundation for assessment of the relationships between social and livelihood concerns and hydropower.

What is the situation with regard to population density in the Townships that are potentially impacted by existing and under construction hydropower? In Townships potentially impacted by existing hydropower plants population densities are slightly skewed towards lower density levels. Townships potentially impacted by hydropower plants under construction are more skewed towards the lower population densities (Figure 3.10, Table 3.1).

**Figure 3.10: Population density of Townships by potential impact from existing and under construction hydropower**



**Table 3.1: Population density of Townships potentially impacted by existing HP, HP under construction and no HP**

Row % of number of Townships in population density brackets for	Low - 13	14 - 27	28 - 49	50 - 73	74 - 111	112 - 145	146 - 187	188 - 251	252 - 3,504	3,505 - High	Missing
Existing HP	6	13	16	16	16	9	9	13	3	0	0
HP under construction	28	17	22	11	0	17	0	0	6	0	0
No HP	9	9	9	9	10	10	10	10	11	11	1

*Data source: Census 2014 Township population, area calculated in GIS. Note: Township potentially impacted by existing and under construction hydropower have been identified and selected on the GIS.*

## 4 MIGRATION

In the Census 2014, a total of 3.7 million people reported to have migrated to their present place of residence from another State, Region or Division within Myanmar. The duration of stay in their present place of residence is not given in the Census report although the information should be available as the question was included in the Census questionnaire.

Figure 4.1 (Table 4.1) shows the origin and destination of internal migrants, with the size of the bands indicating their numbers.

Ayeyarwady accounted for 19% of all out-migration, Bago for 13%, Mandalay for 12% and Magway for 11%. Out-migration from Chin, Kachin, Kayah, Kayin and Tanintharyi each accounted for below 3% of all out-migration. Sagaing, Mon, Shan, and Yangon accounted for between 5 and 10% each of out-migration. Yangon is by far the main destination accounting for 37% of all in-migration. Mandalay accounted for 13% of in-migration, almost equal to out-migration. Shan had a net in-migration at 9% of the total numbers of in-migrants. The migration data reflects the urbanization process with Yangon and Mandalay being the main centers of attraction.

### 4.1 Reasons for migration

Employment and search for employment is the main driver of migration, being the reason for 34% of migrated people (Figure 4.2, Table 4.1). There is some variation between the States, Regions and Divisions with regard to migration for employment with Magway having the highest percentage at 43%, and Yangon the lowest at 25% of these migrants, indicating the net migration to Yangon. Sixty-five per cent of all employment migrants were males and 35% females.

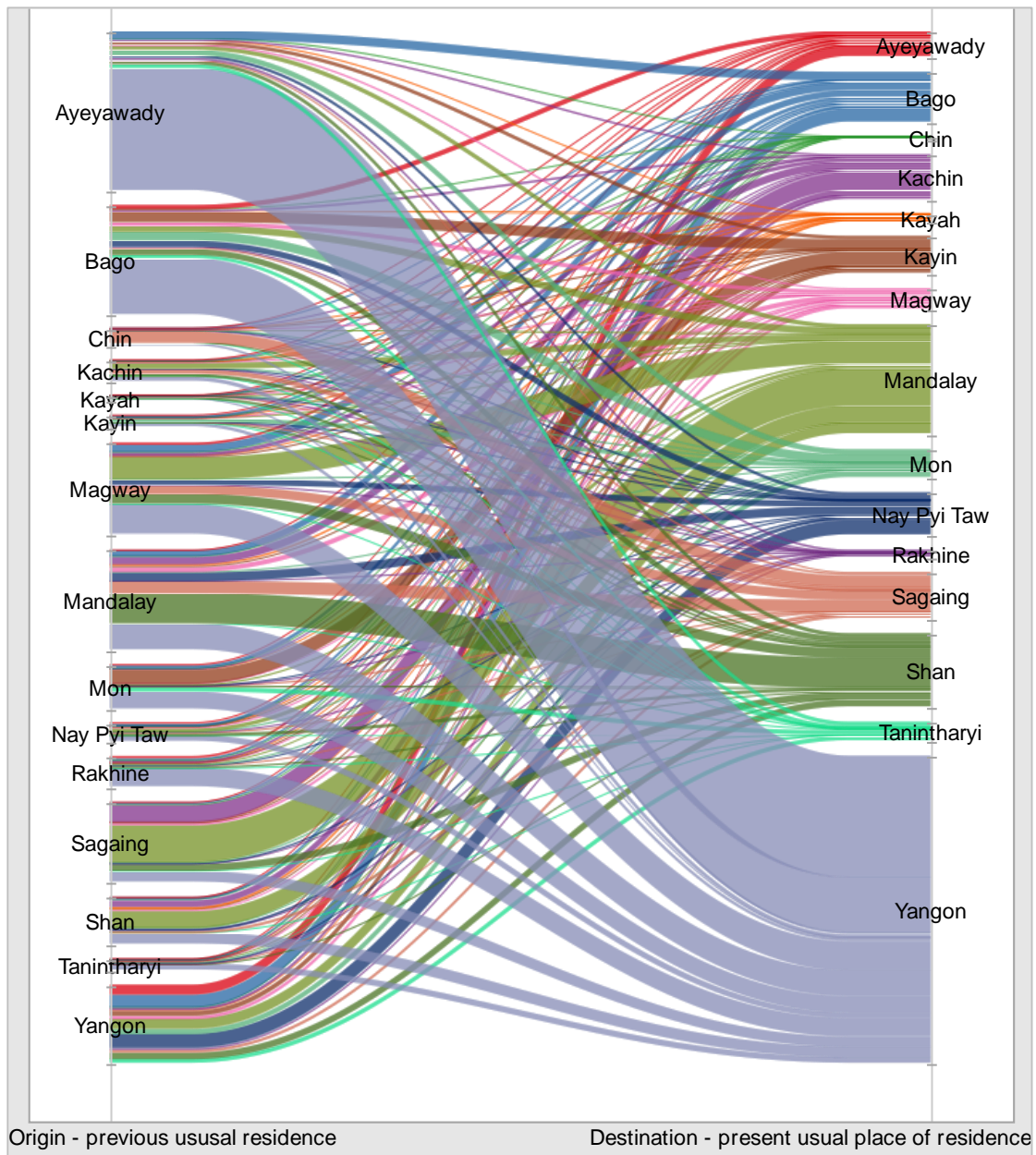
**Table 4.1: Reasons for migration**

Place of previous residence	Conflict		Education		Employment/ Searching employment		Followed family		Marriage		Other reason	
	Sum	Row %	Sum	Row %	Sum	Row %	Sum	Row %	Sum	Row %	Sum	Row %
Ayeyarwady	3,671	0%	22,602	2%	481,318	40%	447,935	37%	202,817	17%	45,281	4%
Bago	2,499	0%	14,148	2%	288,818	37%	293,483	37%	160,450	20%	30,911	4%
Chin	247	0%	5,377	6%	27,398	29%	45,306	48%	9,708	10%	5,414	6%
Kachin	14,847	5%	17,723	6%	87,806	30%	114,441	39%	47,383	16%	14,566	5%
Kayah	1,270	3%	1,860	4%	13,980	31%	18,345	40%	7,965	18%	2,015	4%
Kayin	8,875	5%	4,971	3%	55,153	31%	71,221	40%	29,509	17%	7,505	4%
Magway	1,114	0%	11,417	2%	261,638	43%	201,136	33%	111,392	18%	24,299	4%
Mandalay	4,256	0%	19,711	2%	452,066	38%	458,000	39%	185,532	16%	62,812	5%
Mon	2,257	1%	7,169	2%	122,628	36%	138,947	41%	58,804	17%	12,384	4%
NPT	240	0%	2,523	2%	59,341	37%	63,843	40%	26,069	16%	8,577	5%
Rakhine	4,653	2%	8,490	3%	108,597	37%	113,529	39%	44,745	15%	11,801	4%
Sagaing	1,573	0%	17,398	2%	290,536	41%	225,039	32%	151,079	21%	28,326	4%
Shan	19,070	3%	24,262	3%	250,992	34%	291,188	40%	111,248	15%	32,922	5%
Tanintharyi	1,256	1%	7,433	3%	81,046	36%	96,345	43%	31,093	14%	8,379	4%
Yangon	6,254	0%	45,502	2%	624,323	25%	1,244,692	50%	297,223	12%	262,612	11%
<b>All</b>	<b>72,082</b>	<b>1%</b>	<b>210,586</b>	<b>2%</b>	<b>3,205,640</b>	<b>34%</b>	<b>3,823,450</b>	<b>41%</b>	<b>1,475,017</b>	<b>16%</b>	<b>557,804</b>	<b>6%</b>

Source: Census 2014

The most common reason (but not a driver) for individuals' migration, accounting for 41% of all migrants within the country, is following the household member migrating to a new place. The highest percentage of individuals migrating following family are from Yangon at 50% of the migrants, while the lowest percentage is from Sagaing at 32% of migrants, and the other States/Regions in between these percentages.

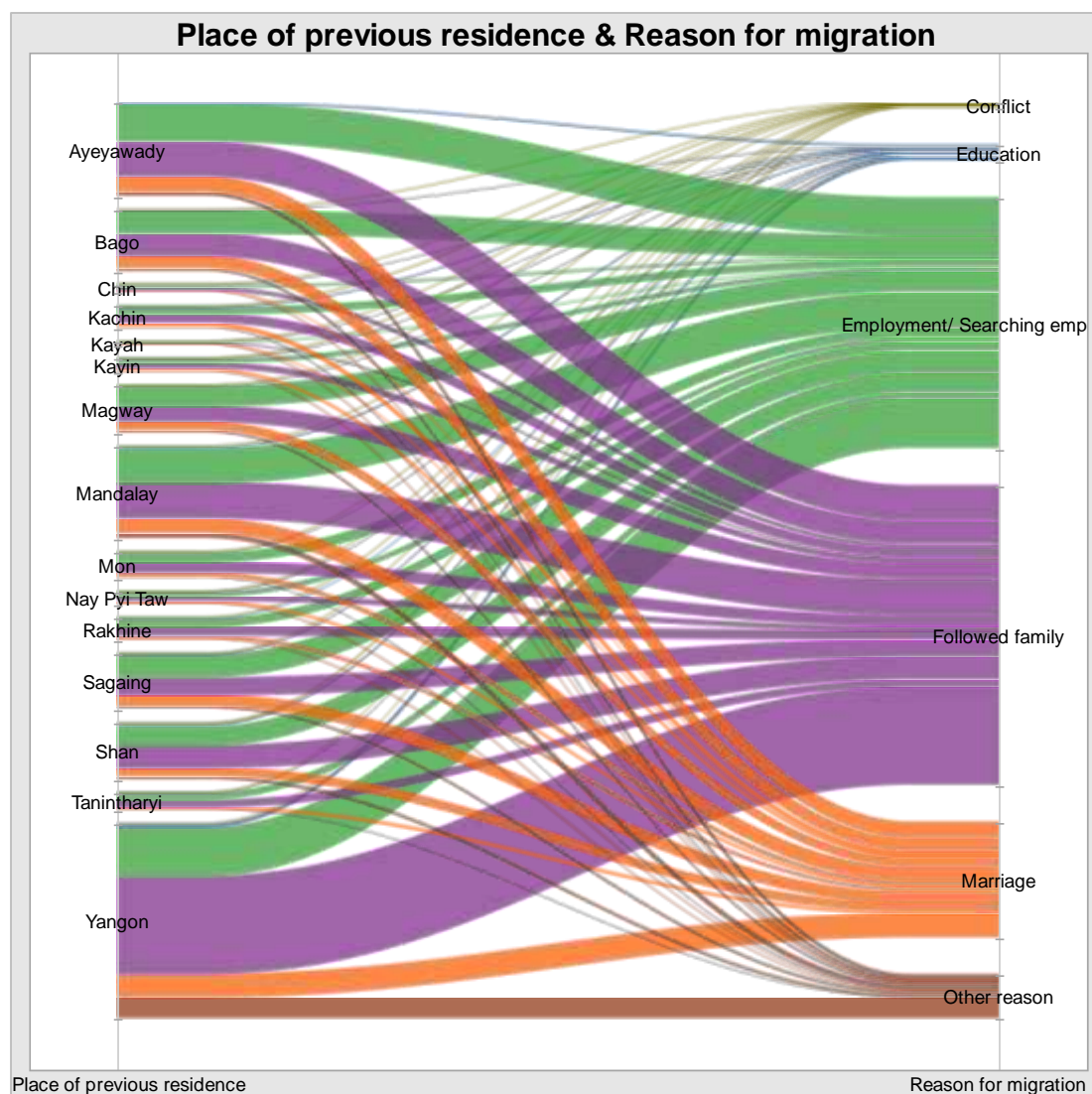
Figure 4.1: Migrations between States/Regions



Data source: Census 2014



Figure 4.2: Reasons for migration from States/Regions



Data source: Census 2014

Forty-nine per cent of female migrants move to follow family, while this is the reason for only 32% of male migrants. Marriage is the third most common reason for migration comprising 16% of all migrants. Education is the reason for migration for 2%, other reasons for 6%, and conflict for 1% of migrants.

In 2016, Enlightened Myanmar Research and the World Bank reported that the reasons for migration are changing from predominantly being a coping mechanism for people facing economic shocks to an economic opportunity to build capital or diversify household income: “People have increasingly nuanced understandings of the risks and benefits of migration, with certain types and destinations falling out of favour due to perceived higher risks or lower returns<sup>16</sup>”

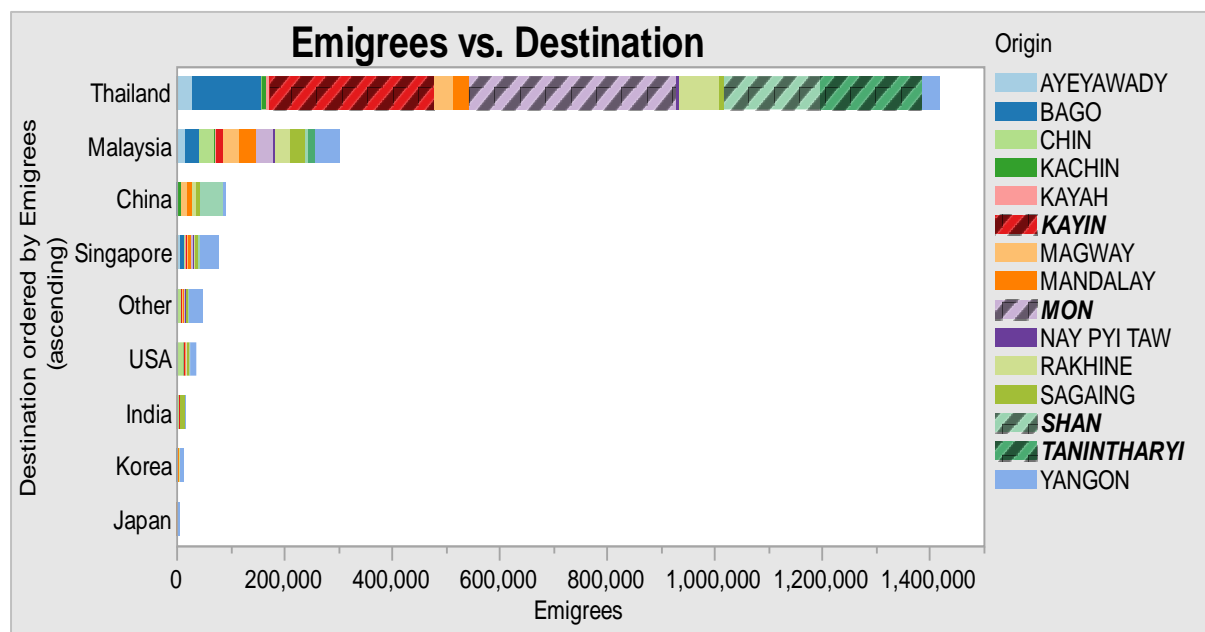
#### 4.2 Emigration - household members living outside Myanmar

According to Census 2014, two million former household members were living outside Myanmar. Seventy per cent of those were living in Thailand, 15% in Malaysia, and the remaining in China, Singapore and other countries. 1.2 million of all household members living outside Myanmar were

<sup>16</sup> Enlightened Myanmar Research And World Bank, (2016). *Livelihoods And Social Change In Rural Myanmar*. Qualitative Social And Economic Monitoring Round Five Report. [Online] World Bank Group, Emr, Commissioned By The Livelihoods And Food Security Trust Fund (Lift). Available at: <http://documents.worldbank.org/curated/en/194531470632870072/pdf/107499-volume-1-WP-P130963-PUBLIC-QSEM-5.pdf>.

men. About 1.7 million of the people living abroad were between 15 and 39 years of age, and around 1.1 million of these were men. The largest numbers of emigrants were from Mon, Kayin, Shan, Bago and Rakhine (Figure 4.3, Table 4.2, Figure 4.4). This is a reflection of the conflicts in those areas.

Figure 4.3: Emigration to other countries

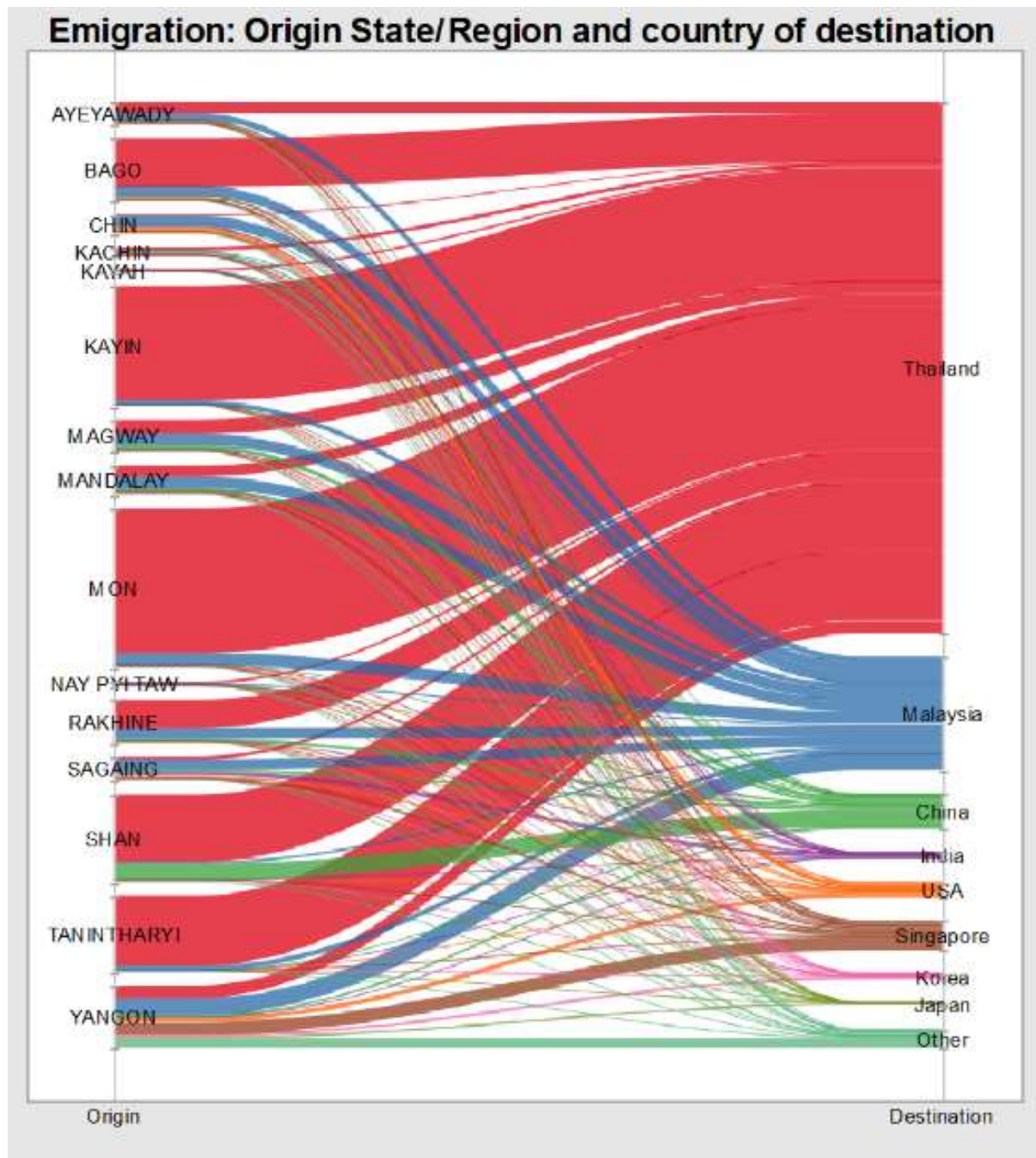


Data source: Census 2014

Table 4.2: Emigrants - household members living abroad

Origin	Destination									
	Thailand	Malaysia	China	India	USA	Singapore	Korea	Japan	Other	All
AYEYAWADY	29,382	16,704	1,287	557	527	8,021	671	235	2,104	59,488
BAGO	129,069	26,564	2,217	148	699	6,592	1,425	306	2,671	169,691
CHIN	588	27,016	202	5,880	12,117	1,695	75	44	3,928	51,545
KACHIN	9,250	2,712	6,137	200	916	1,273	61	222	709	21,480
KAYAH	5,601	1,134	55	17	414	716	61	36	351	8,385
KAYIN	304,980	12,864	57	44	2,097	1,150	167	56	1,346	322,761
MAGWAY	36,674	30,020	11,454	126	348	3,360	1,016	153	1,271	84,422
MANDALAY	28,334	30,998	8,239	341	1,005	5,659	1,872	510	3,113	80,071
MON	385,487	32,620	405	53	957	4,342	862	189	1,671	426,586
NAY PYI TAW	6,214	3,679	396	61	109	691	143	88	547	11,928
RAKHINE	74,370	28,280	7,833	345	714	1,798	362	121	1,679	115,502
SAGAING	7,981	27,184	6,023	9,012	4,642	6,343	686	236	2,145	64,252
SHAN	179,783	5,749	42,490	156	916	3,424	198	412	2,741	235,869
TANINTHARYI	187,968	12,879	79	40	537	685	156	162	726	203,232
YANGON	32,791	45,593	5,389	995	11,579	33,910	6,837	4,827	24,777	166,698
<b>All</b>	<b>1,418,472</b>	<b>303,996</b>	<b>92,263</b>	<b>17,975</b>	<b>37,577</b>	<b>79,659</b>	<b>14,592</b>	<b>7,597</b>	<b>49,779</b>	<b>2,021,910</b>

Figure 4.4: Emigration: origin State/Region and country of destination



### 4.3 Internally Displaced Persons (IDP)

Displacement of persons due to conflict, forced eviction, or other reasons is a serious issue in Myanmar. In the context of the SEA it is relevant due to magnitude of the problem and because many IDPs are in the areas, or have fled from, areas where hydropower development is planned. Further analysis on IDPs is included in the Conflict chapter.



## 5 URBANIZATION

In energy planning the degree and rate of urbanization is an important variable for deciding the best and most cost efficient type of electricity provision for a particular area. Urbanization is taking place at an accelerating pace. In 2015, the annual urban population growth rate was 2.5% compared to the annual rural growth rate of 0%.

Population data for 121 cities and towns from the population Census 2014 shows the number of cities and towns and their population (Table 5.1, Table 5.2).<sup>17</sup>

**Table 5.1. Number and size of towns<sup>18</sup>**

Town size	Number of towns	Population	% of town population
> 1 million	2	5,954,070	45.91%
250,000-500,000	4	1,106,468	8.53%
100,000-250,000	12	1,767,933	13.63%
50,000-100,000	26	1,805,432	13.92%
25,000-50,000	45	1,611,286	12.42%
Less than 25,000	32	724,490	5.59%
<b>All</b>	<b>121</b>	<b>12,969,679</b>	<b>100.00%</b>

**Table 5.2: Details of towns by population size**

Pop 2014 (rounded)	Number of towns	Total population	% Of town population
4,730,000	1 (Yangon)	4,728,524	36.46%
1,230,000	1 (Mandalay)	1,225,546	9.45%
330,000	1	333,506	2.57%
260,000	1	264,804	2.04%
250,000	2	508,158	3.92%
240,000	1	243,031	1.87%
210,000	1	207,489	1.60%
170,000	2	344,108	2.65%
160,000	1	158,783	1.22%
130,000	2	265,367	2.05%
120,000	1	115,141	0.89%
110,000	3	333,266	2.57%
100,000	1	100,748	0.78%
90,000	5	446,653	3.44%
80,000	6	478,885	3.69%
70,000	2	143,349	1.11%

<sup>17</sup> The total population of the towns included in this list is lower than the urban population data from the World Bank, indicating that some areas classified as urban has been omitted. However, the list of towns and their population gives a good indication of the distribution of towns by their population sizes.

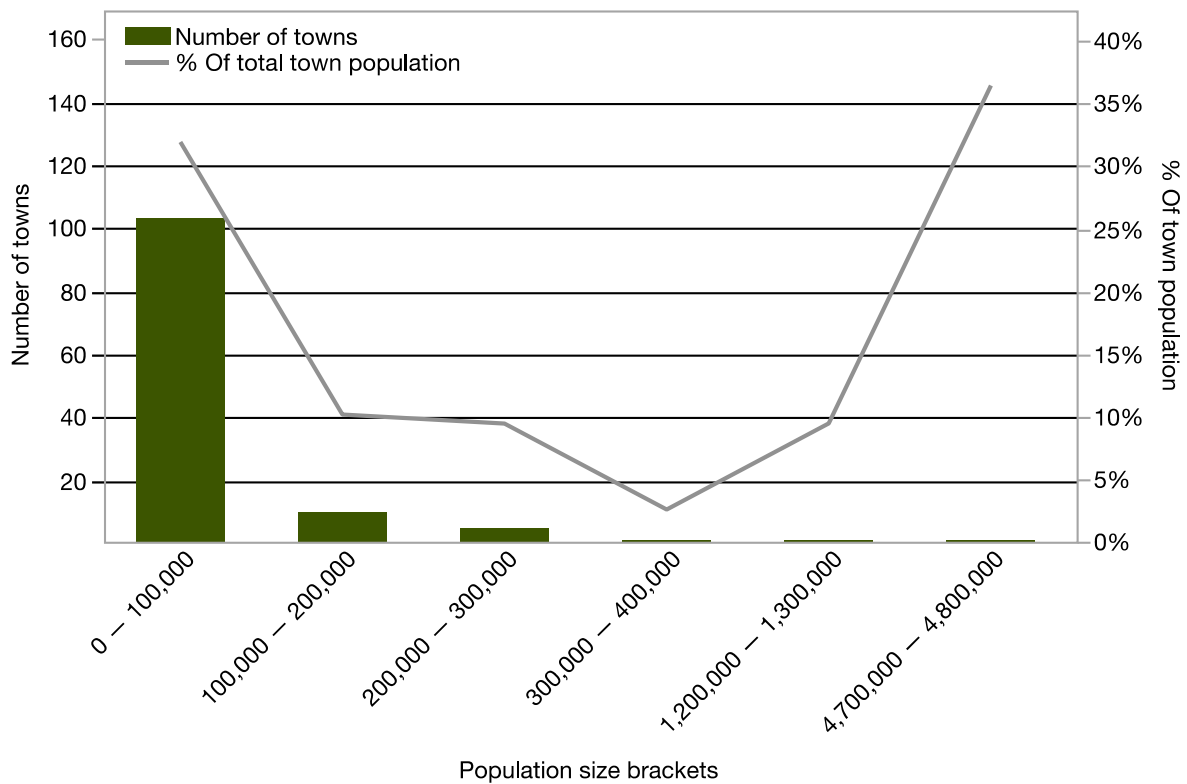
<sup>18</sup> Kalemno, K., Aunglan, A., Pyè, P. and Lwin, P. (2017). *Myanmar: Regions, States, Major Cities & Towns - Population Statistics in Maps and Charts*. [online] Citypopulation.de. Available at: <http://www.citypopulation.de/Myanmar-Cities.html>.

Pop 2014 (rounded)	Number of towns	Total population	% Of town population
60,000	9	528,642	4.08%
50,000	9	441,778	3.41%
40,000	17	694,385	5.35%
30,000	23	683,026	5.27%
20,000	32	724,490	5.59%
<b>All</b>	<b>121</b>	<b>12,969,679</b>	<b>100.00%</b>

Source: <http://www.citypopulation.de/Myanmar-Cities.html>

Figure 5.1 shows the number of towns and population in a breakdown that is similar to the classification of towns used in urban planning.

**Figure 5.1: Town sizes, numbers and percentage of town population**



There are two cities with more than 1 million population; Yangon is the largest with 4.7 million people, and Mandalay with 1.2 million (Figure 5.1). These cities account for 46% of the urban population - Yangon, 36% and Mandalay, 9%. There are no mid-size towns with between 0.5 and 1 million people, but four towns with 250,000-500,000 people accounting for 8.5% of the urban population. Almost 40% of the town population live in towns with between 25,000 and 250,000 people. Figure 5.1 shows that 25% of the town population lives in around 100 towns of less than 100,000 people.

Townships (which it is worth remembering are administrative units, not towns) with a small population can still have a high degree of urbanization (Figure 5.2 and Figure 5.3) such as is the case in some Townships in Kachin, Sagaing and Shan.

Figure 5.2: Percentage of urban population in Townships 2014

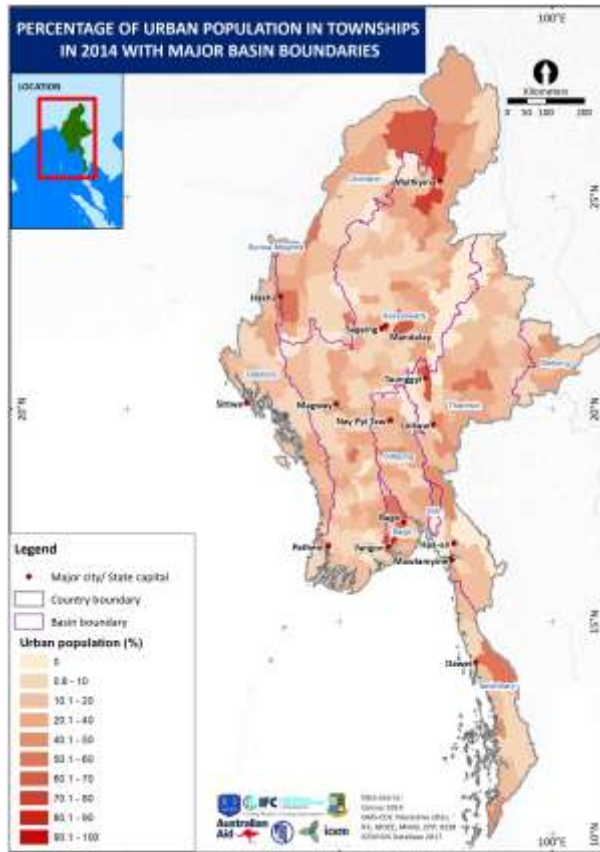
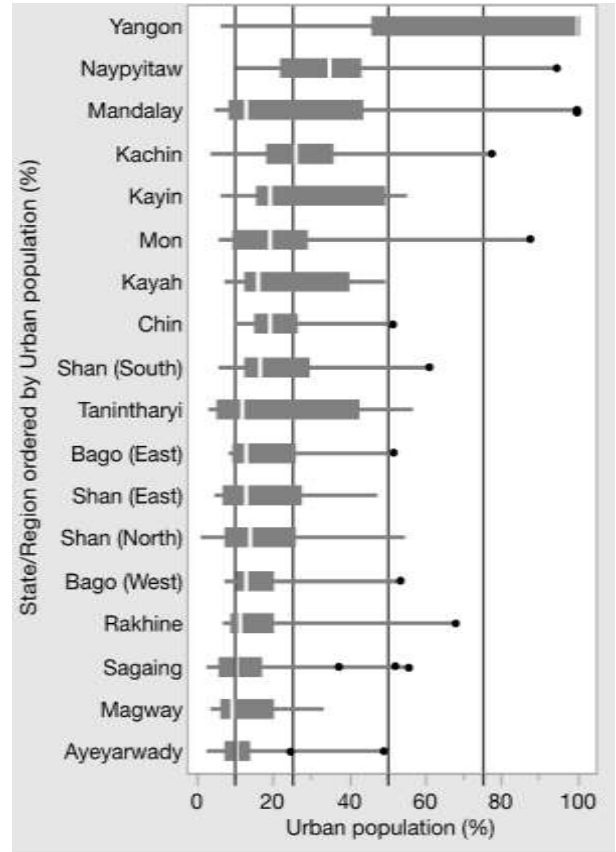


Figure 5.3: Percentage urban population (mean %) by State/Region



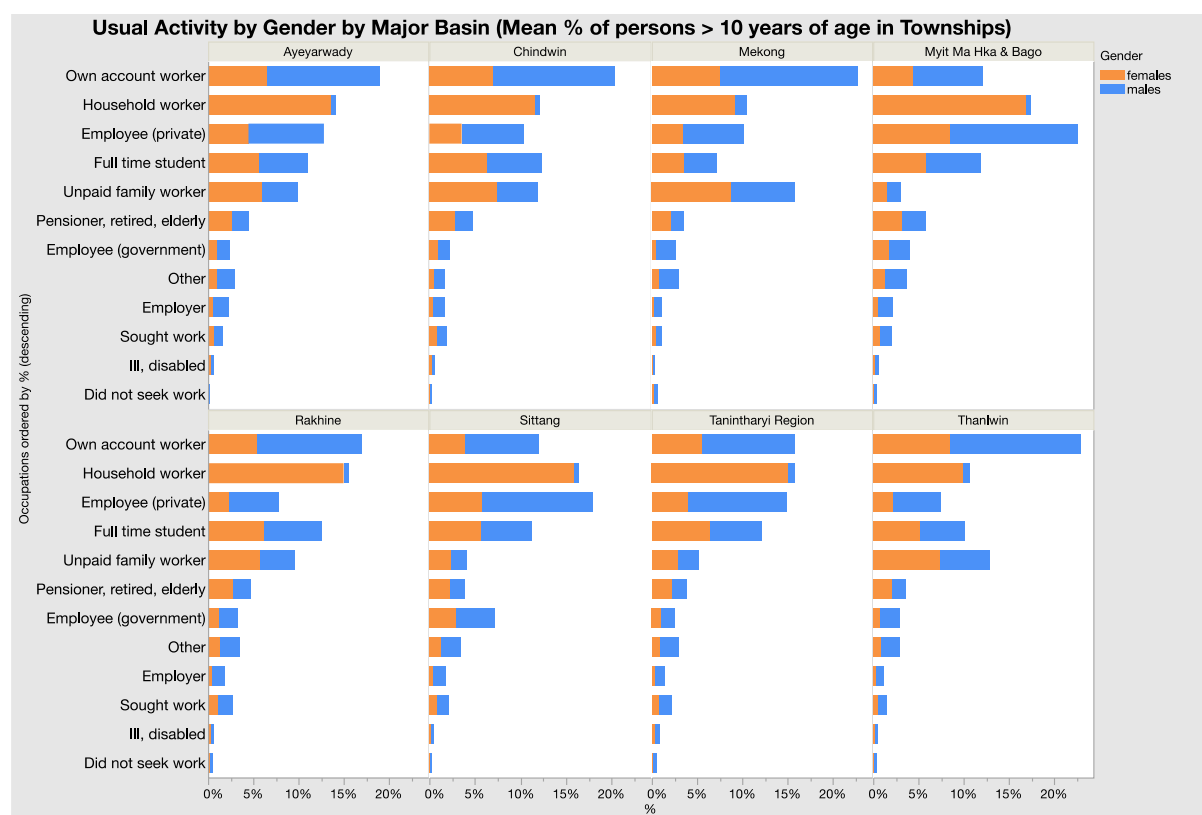
## 6 OCCUPATIONS AND LIVELIHOODS

In the Census 2014, the data on the ‘usual activities’ of people are grouped into a number of categories of which the largest is ‘own account worker’ (which would be similar to ‘self-employed’). Figure 6.1 shows the mean percentage of occupations in Townships aggregated by major basin.

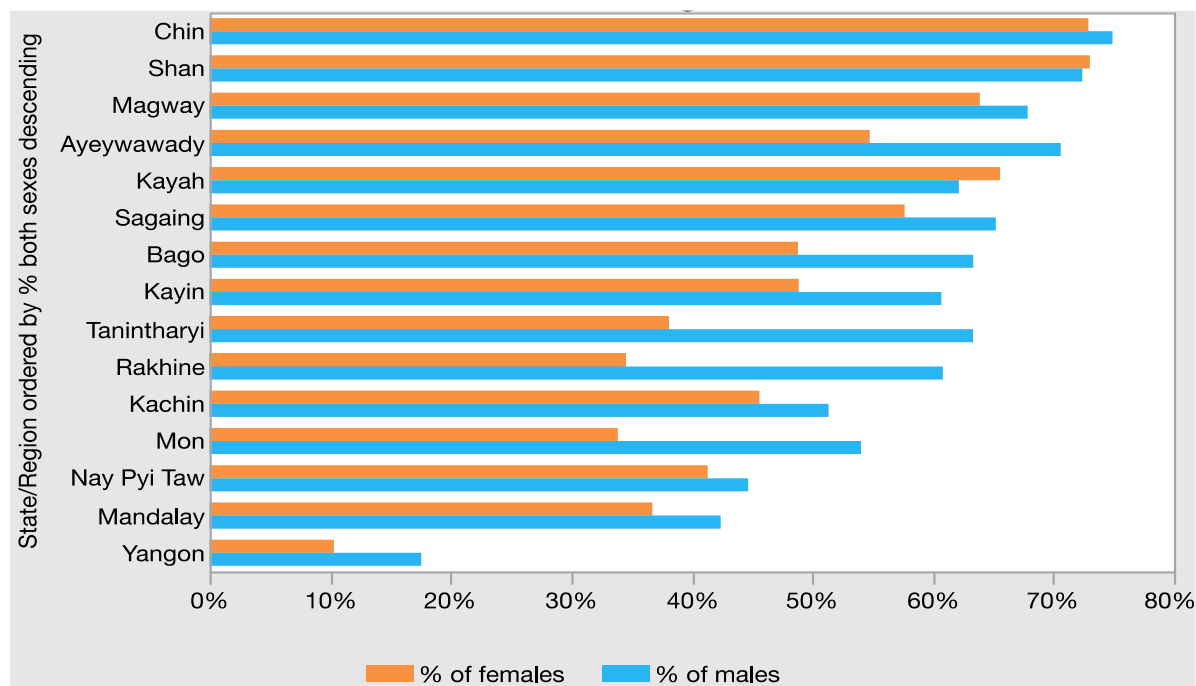
There is no statistically significant difference between the basins in terms of occupations and gender-wise distributions on occupations.

The Census includes more detailed data on persons employed in various industries, aggregated at State/Region level. Agriculture, forestry and fishing employ the largest proportion of people (Figure 6.2). The Census’s aggregation of agriculture, forestry and fishing into one category constrains the analysis of livelihoods that are mainly dependent on river resources and which therefore could be directly impacted by hydropower development. The agriculture, forests and fisheries sectors are described in other chapters of this baseline assessment report.

Figure 6.1: ‘Usual activity’ by gender



**Figure 6.2: Agriculture, forestry and fishing, % employed by Gender and State/Region**



The percentage employed in mining and quarrying is highest in Kachin at almost 6% of the work force, followed by Kayah at 3% and Sagaing and Mandalay at almost 2% each. It is almost exclusively men who are engaged in those activities. Mining and quarrying have links to hydropower development in a number of ways: the SEA Regional Basin Consultations revealed serious problems with river pollution by these activities in several places, notably in the Chindwin River. Mining and quarrying includes sand and gravel extraction from rivers.

### 6.1 Trends in livelihoods

In the absence of time series data on occupation and employment structure, we turn to a qualitative social and economic monitoring process of “Livelihoods and Social Change in Rural Myanmar”, which is funded by a number of donors, including Australian Aid<sup>19</sup>. The report from 2016 looks at monitoring from 2012 to 2015 in a panel of 54 villages in Ayeyarwady, Chin, Magway, Mandalay, Rakhine and Shan. The report has the following observations of significant changes that have occurred over the time period:

- “1. Myanmar presents a mixed picture for agricultural livelihood development: Some areas have experienced improvement, while some remain vulnerable. Wages have increased but peak season labor scarcity remains a challenge.
2. Access to credit has been a focus of both government and donor assistance. Villages across the country now have greater access to low interest loans.
3. Village governance has continued to change following the introduction of a Ward and Village Tract Administration Law. Village tract administrators have experienced increased levels of authority, while the influence of village administrators has declined.
4. People have higher expectations of government, including in delivering government services, and are more willing to express discontent when their expectations are not met.”

The monitoring report mentions that the position of subsistence and small-scale fishermen is declining, however, it is not clear why that is the trend and to what degree inland fishers are included. Further information on fisheries and livelihoods is included in the Fisheries and Aquatic Ecology chapter of this Baseline Assessment report. The Economic chapter discusses in detail livelihoods in key

<sup>19</sup> Reference 16

economic sectors related to hydropower development; power, agriculture, mining, forestry and transport.

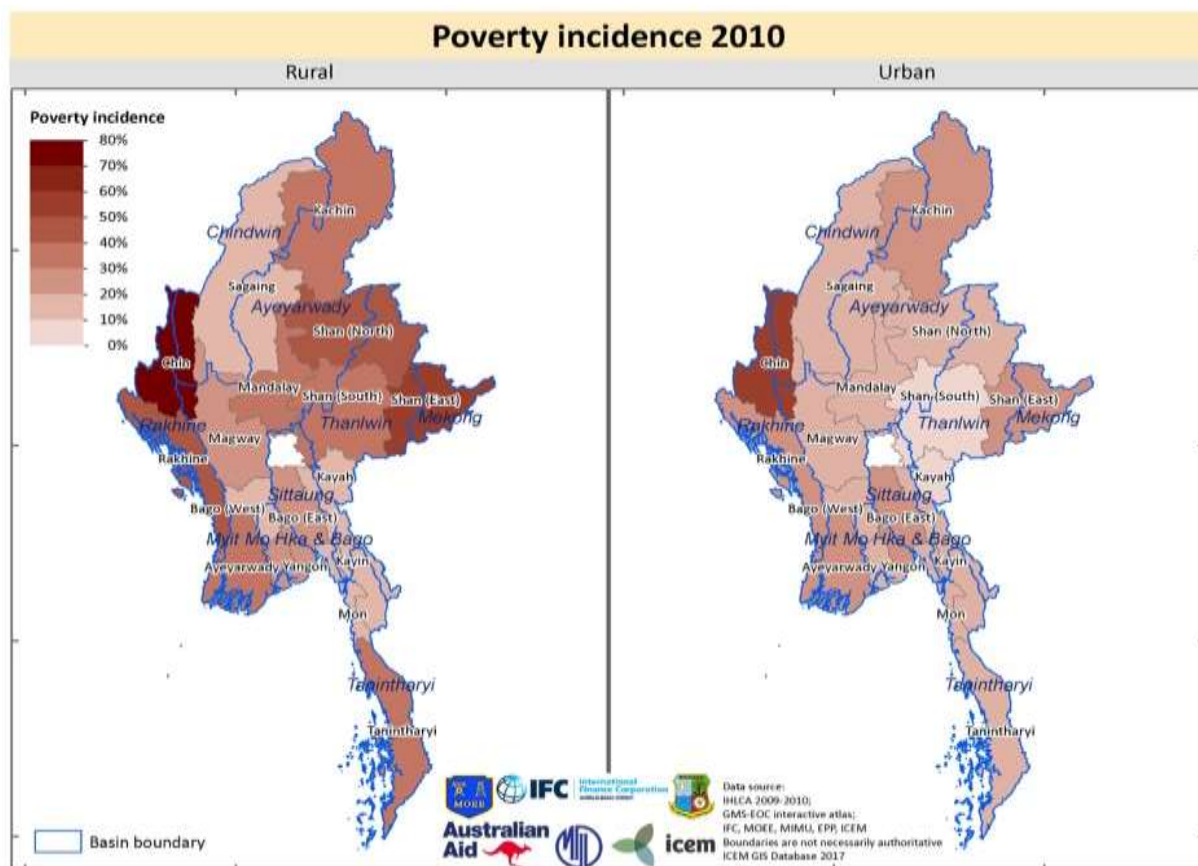
### 6.1.1 Agriculture

Agriculture is forecast to employ many people in Myanmar long into the future. Low rice yields are the main reason behind low agricultural productivity. Rice covers about 60% of the total cultivated land area and accounts for 97 percent of total food grain production by weight. Rice is one of the country’s major exports. Increasing agricultural profitability and returns to labour by increasing yields and other improvements will be central for effective poverty reduction. The problems behind low rice productivity are mainly inefficient irrigation, lack of access to extension services, and poor production practices (see Economics chapter, Agriculture section of this baseline assessment report).

## 6.2 Poverty

Before 2005, reliable poverty data for Myanmar was not available. In 2005 the first Integrated Household Living Conditions (IHLCS/A) Survey/Assessment was carried out, and repeated in 2009-2010. The IHLCA 2009-2010 provides data for 2004-2005 and 2009-2010.<sup>20</sup> The IHLCA was based on a sampling to allow for results on State/Region/Division level (Figure 6.3). Thus, while it is not possible to link poverty data to Townships impacted by existing and under construction hydropower, the relationship between hydropower and poverty at the State/Region/Division level still allows for valuable analysis.

Figure 6.3: Poverty incidence 2010 by State, Region overlaid on Major River basins



Data source: IHLCA 2009-2010

<sup>20</sup> IHLCA Project Technical Unit, (2011). Integrated Household Living Conditions Survey In Myanmar (2009-2010), Poverty Profile. Yangon: Ministry of National Planning and Economic Development, UNDP, UNICEF, Sida



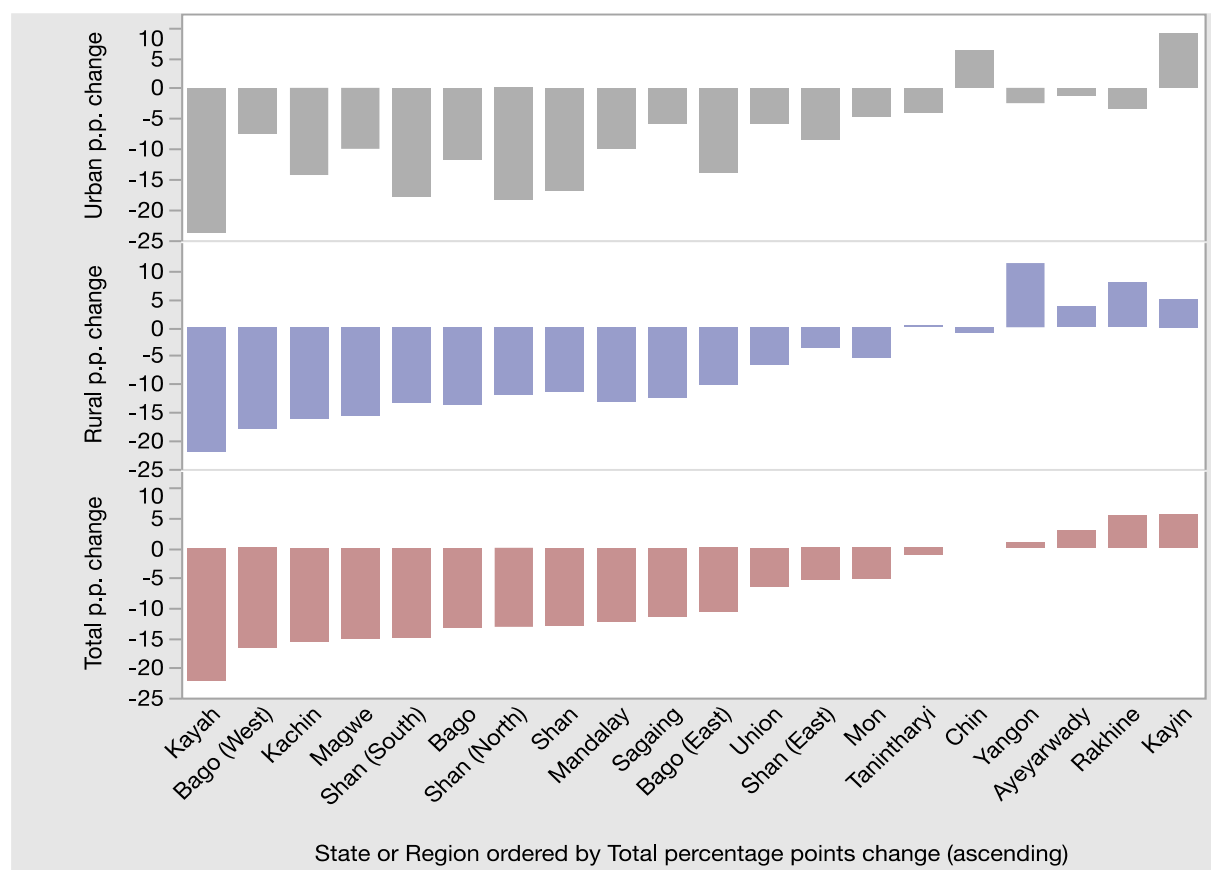
In 2010 around 25% of the population was below the poverty line, with most poor in rural areas<sup>21</sup>. The actual (nominal) values of the food poverty and poverty lines per adult equivalent per year, in 2005 and 2010 kyats, were:

	2005	2010
Poverty Line	162,136 Kyat/ US\$ 150 per year	376,151 Kyat/ US\$ 290 per year
Food Poverty Line	118,402 Kyat/ US\$ 110 per year	274,990 Kyat/ US\$ 212 per year

Overall, rural poverty incidence (same as poverty rate) was at 29%, around double that of urban poverty, at 15%. Furthermore, the contribution of rural poverty to total poverty was 84%.

The highest poverty incidence was in Chin at 73%, with 80% rural poverty incidence. Rakhine was at 44%, Tanintharyi and Shan at 33% and Ayeyarwady at 32%. Regarding food poverty, the highest values were in Chin at 25% followed by Rakhine (10%), Tanintharyi (9.6%) and Shan (9%). These four states/regions remain the poorest, no matter the FGT poverty measure used. The four states/regions that contributed most to overall national poverty are Ayeyarwady (18.7%), Mandalay (16%), Shan (15.4%) and Rakhine State (14.9%). Together, these four states accounted for around two thirds of total food poverty in Myanmar (Figure 6.4, Table 6.1).

**Figure 6.4: Poverty incidence percentage points change 2005-2010**



Source: IHLCA 2009-2010

<sup>21</sup> The poverty line represents a minimum of food and non-food expenditures based on the consumption patterns of the second quartile of the consumption distribution. The food poverty line measures how much consumption expenditure is required to meet basic caloric needs only. The poverty line adds an allowance for non-food expenditure.

**Table 6.1: Trends in Poverty Incidence, 2005-2010 (%) (sorted - descending)**

State or Region	Urban		Rural		Total	
	2005	2010	2005	2010	2005	2010
Chin	45.9	52.1	80.9	80.0	73.3	73.3
Shan (East)	37.1	28.6	56.0	52.3	51.8	46.4
Rakhine	25.5	22.1	41.2	49.1	38.1	43.5
Shan (North)	34.7	16.3	55.0	43.1	50.6	37.4
Shan	31.0	14.1	50.5	39.2	46.1	33.1
Tanintharyi	20.8	16.7	37.2	37.5	33.8	32.6
Ayeyarwady	24.4	23.1	30.3	33.9	29.3	32.2
Kachin	37.7	23.4	46.8	30.6	44.2	28.6
Magwe	25.8	15.8	43.9	28.2	42.1	27.0
Mandalay	24.1	14.1	44.7	31.6	38.9	26.6
Shan (South)	26.1	8.3	44.5	31.2	40.2	25.2
Bago (East)	34.8	20.9	30.2	20.1	30.9	20.2
Bago	30.7	19.0	31.8	18.2	31.6	18.3
Kayin	7.8	16.8	12.5	17.5	11.8	17.4
Mon	22.5	17.8	21.3	16.0	21.5	16.3
Yangon	14.4	11.9	17.4	28.7	15.1	16.1
Bago (West)	23.1	15.6	33.8	15.9	32.6	15.9
Sagaing	21.9	16.0	27.4	14.9	26.6	15.1
Kayah	26.1	2.3	38.2	16.3	33.6	11.4
Union	21.5	15.7	35.8	29.2	32.1	25.6

*Source: Integrated Household Living Conditions Survey, 2004-2005 and Integrated Household Living Conditions Survey, 2009-2010.*

Overall, on the economic dimensions of well-being, the IHLCA report states that the data present a mixed picture with certain economic aspects of well-being have improved markedly, while others have deteriorated or stagnated. In light of these conflicting results, caution is needed in the interpretation of data on poverty levels and trends, in particular on the magnitude of the decline in poverty.

The two rounds of IHLCA show that overall poverty declined from 32.1% in 2005 to 25.6% in 2010, however with large variations among the States, Regions and Divisions (Figure 6.7, Table 6.2). The poverty incidence percentage increased in Yangon, Ayeyarwady, Rakhine and Kayin, especially in the rural areas. In Chin State only the urban poverty rate increased. In all other States, Regions and Divisions the poverty incidence percentage decreased.

**Table 6.2: Poverty incidence percentage point change - 2005 - 2010**

State or Region	Urban p.p. change	Rural p.p. change	Total p.p. change
Kayah	-23.8	-21.9	-22.2
Bago (West)	-7.5	-17.9	-16.7
Kachin	-14.3	-16.2	-15.6
Magwe	-10	-15.7	-15.1
Shan (South)	-17.8	-13.3	-15
Bago	-11.7	-13.6	-13.3
Shan (North)	-18.4	-11.9	-13.2
Shan	-16.9	-11.3	-13
Mandalay	-10	-13.1	-12.3
Sagaing	-5.9	-12.5	-11.5
Bago (East)	-13.9	-10.1	-10.7
Union	-5.8	-6.6	-6.5
Shan (East)	-8.5	-3.7	-5.4
Mon	-4.7	-5.3	-5.2
Tanintharyi	-4.1	0.3	-1.2
Chin	6.2	-0.9	0
Yangon	-2.5	11.3	1
Ayeyarwady	-1.3	3.6	2.9
Rakhine	-3.4	7.9	5.4
Kayin	9	5	5.6

**Poverty dynamics:** The poverty dynamics between 2005 and 2010 were analysed and presented in a report under the IHLCA<sup>22</sup> (refer Figure 6.5 & Figure 6.6) (Figure 6.7). It was found that many households fluctuate around the poverty line and transitory, which is the same as temporary poverty appears to be significant. Every year some households escape from poverty and others fall into poverty. This is linked to the extensive dependence of the majority of the population on agriculture and natural resources with the associated vulnerability to bad weather: floods and droughts, storms and diseases. Households that have been poor for years are considered chronically poor.

<sup>22</sup> IHLCA Project Technical Unit, (2011). *Integrated Household Living Conditions Survey In Myanmar (2009-2010), Poverty Dynamics*. Yangon: Ministry of National Planning and Economic Development, UNDP, UNICEF, Sida.

Figure 6.5: Conceptual structure of poverty dynamics

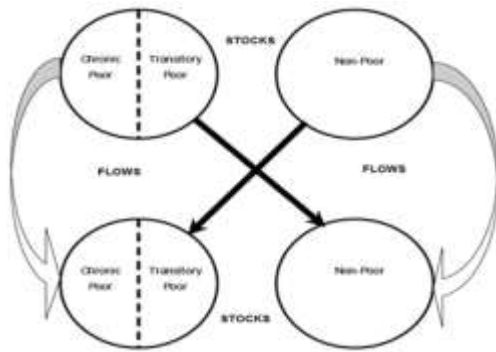


Figure 6.6: Trajectories of poverty

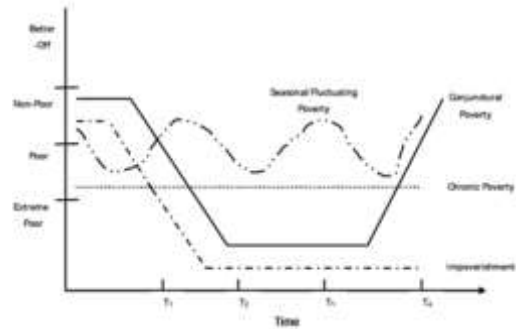
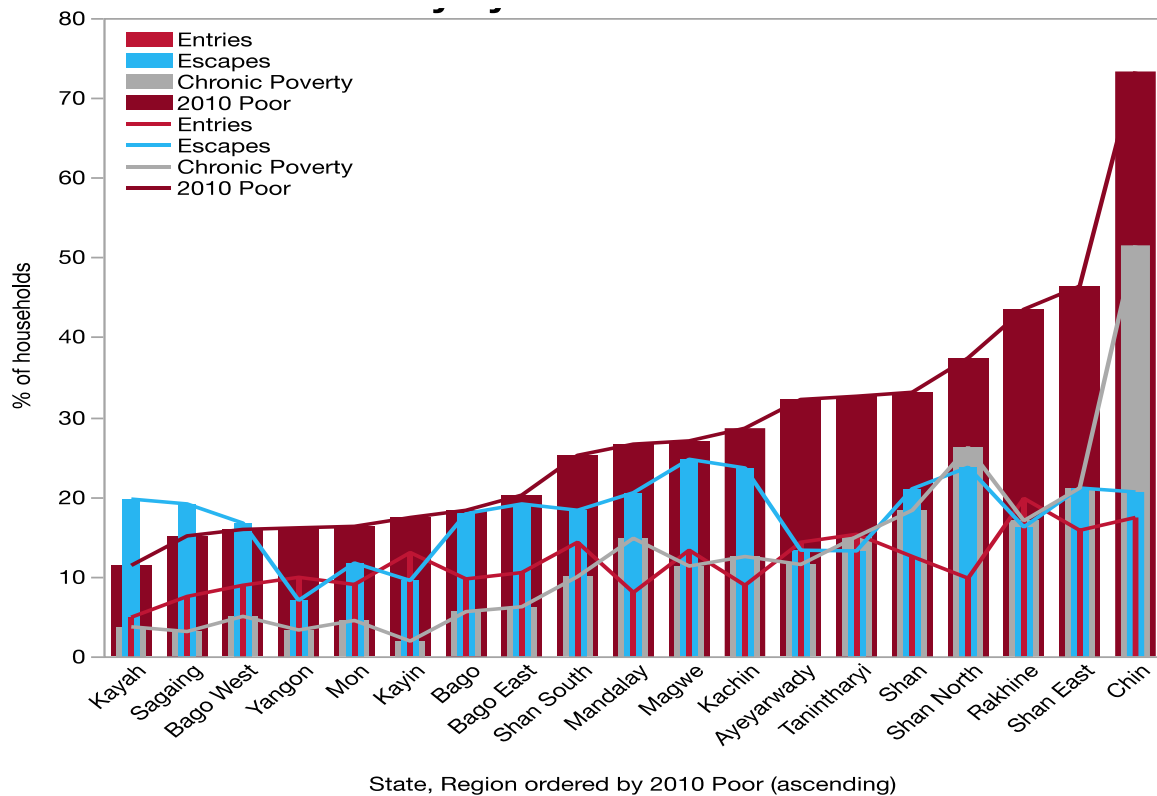


Figure 6.7: Poverty dynamics 2005-2010



The Poverty Dynamics report from 2010 data suggest transitory poverty is close to 3 times the size of chronic poverty, affecting 28% vs. 10% of households. The highest percentages of entries into poverty were in Rakhine, Kayin, and Shan South. The highest percentages of households escaping from poverty were in Magwe, Kachin, Shan North, followed by Kayah and Sagaing (Figure 6.7).

Table 6.3 presents the poverty transition categories by the industrial classification of the main economic activity of household members.

**Table 6.3: Poverty dynamics, entries and escapes by occupation**

Classification	% of Entries HHs	% of Escape HHs	% of HHs in Chronic Poverty	% of Poor HHs	% of Non-Poor HHs
Agriculture, Hunting, Forestry	56.3	65.7	67	60.9	53.4
Construction	5	3.4	3.5	3.7	3.7
Education	0.4	1.1	0.6	0.4	2.1
Fishing	4.8	2.6	5.1	5	2.3
Health and Social Work	0.8	1	0.2	0.4	0.7
Manufacturing	4.2	2.1	2.5	3.7	4
Trade and repair services	8.4	10.6	5.9	8	17.4
Transport, Storage and Communication	3	4.1	3.3	3	5.6
Other	17.1	9.4	12	14.9	10.8

Data source: IHLCA 2009-2010

**Social well-being:** The IHLCA 2009-2010 suggest statistically significant broad improvements on the indicators of social well-being from 2005 to 2010. Indicators include quality roofing, access to safe drinking water, improved sanitation, health care, and electricity; literacy, primary and secondary school enrolment and births attended by skilled personnel.

**Rate of landless households:** The IHLCA 2009-2010 study also found that 24% of households whose primary economic activity was agriculture were landless. There is considerable variation across states and regions with the highest rates found in Bago (41%), Yangon (39%) and Ayeyarwady (33%) (Figure 6.8, Table 6.4). The rate of landless was higher among poor than non-poor households at 34% and 19% respectively. It is likely that many of the landless are employed as casual workers in agriculture.

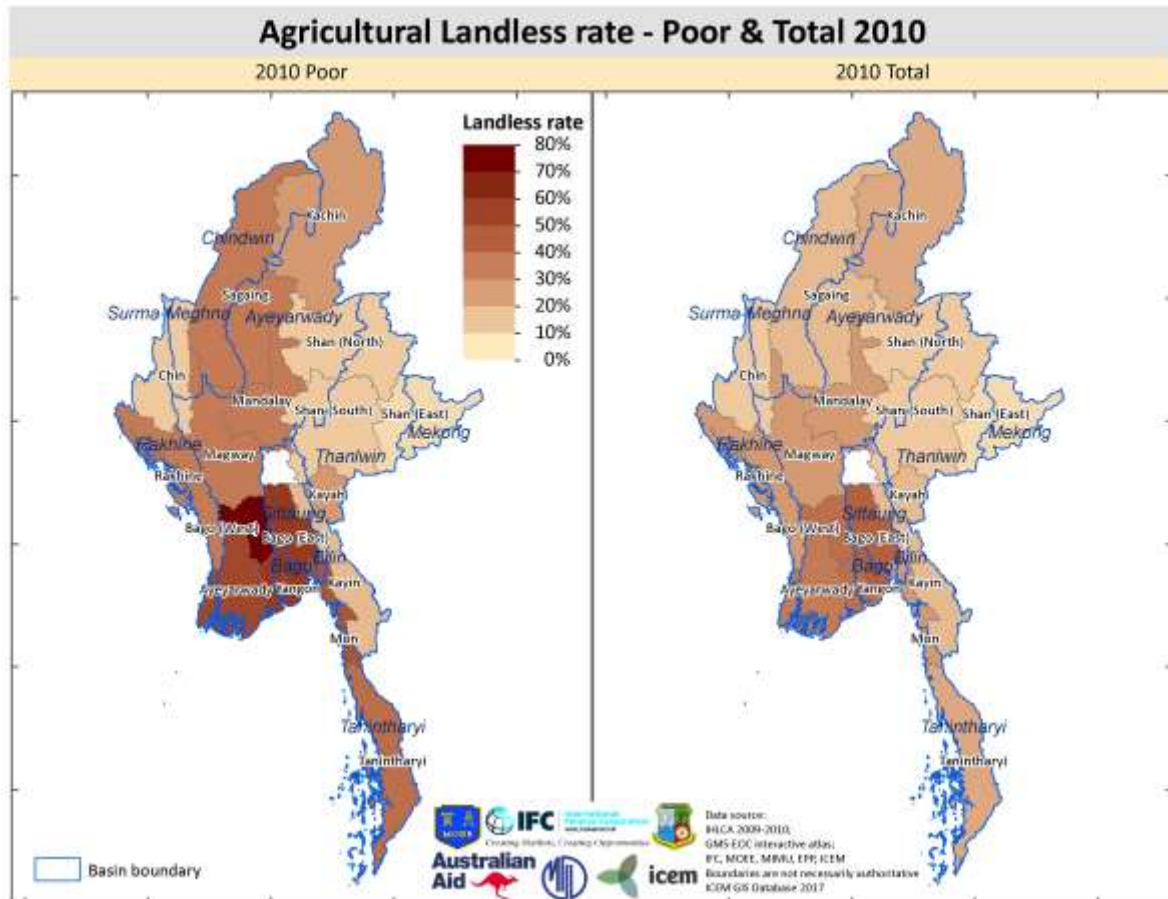
**Table 6.4: Agricultural landless rate 2005 - 2010, for Poor, Non-Poor and total by State/Region**

State/Region	Agricultural landless rate			
	2010 Poor	2010 Non poor	2005 Total	2010 Total
Ayeyarwady	50.4	24.2	32.3	32.6
Bago	69.6	35.4	40.9	40.7
Bago (East)	64.4	36.8	45.6	41.9
Bago (West)	75.8	34.4	36.1	39.8
Chin	8.4	7	10.2	8.1
Kachin	21.4	15	25.6	17.2
Kayah	24.5	10.8	11.1	12.7
Kayin	15	11	16.4	11.7
Magway	33.4	19.4	26.2	23.1
Mandalay	31.8	19	24.3	23
Mon	49.9	20.1	24.9	24.9
Rakhine	34	17.8	31.5	24.6
Sagaing	30.3	12.8	15.6	15.3
Shan	7	6.3	9.9	6.6
Shan (East)	2.1	1.8	7.6	1.9
Shan (North)	8.5	6	10.6	7.2
Shan (South)	7.4	7.8	10	7.7
Tanintharyi	39.6	10.2	25.5	20.3



State/Region	Agricultural landless rate			
	2010 Poor	2010 Non poor	2005 Total	2010 Total
Yangon	57.5	29.5	51.2	39.4
UNION	33.6	19.8	25.7	23.6

Figure 6.8: Agricultural landless rate - poor households and total 2010



### 6.2.1 Rivers and streams as drinking water source and proxy indicators for poverty

An indicator of direct relevance to hydropower development is the percentage of households that uses rivers or streams for drinking water. Furthermore, in the absence of high-resolution and updated poverty data, some proxy indicators for poverty that are used in various multi-dimensional poverty indices have been analysed. These are the characteristics of house materials, namely earth floor, 'dhani'/'theke'/leaf roof and bamboo walls.

Figure 6.10 shows the percentage of households in Townships that use rivers and streams as drinking water source, with the Major Basin boundaries. Aggregated at State/Region level, there is a statistically significant difference between them in this respect. Ayeyarwady, Kayah and Shan South have a significantly higher average percentage than other State/Regions. However, there is no statistical significant difference between the Townships that are potentially impacted by existing or under construction hydropower and the percentage of households that uses rivers or stream for drinking water (Figure 6.9).

Figure 6.9: Rivers and streams as drinking water source - analysis of means (ANOM) by State/Region

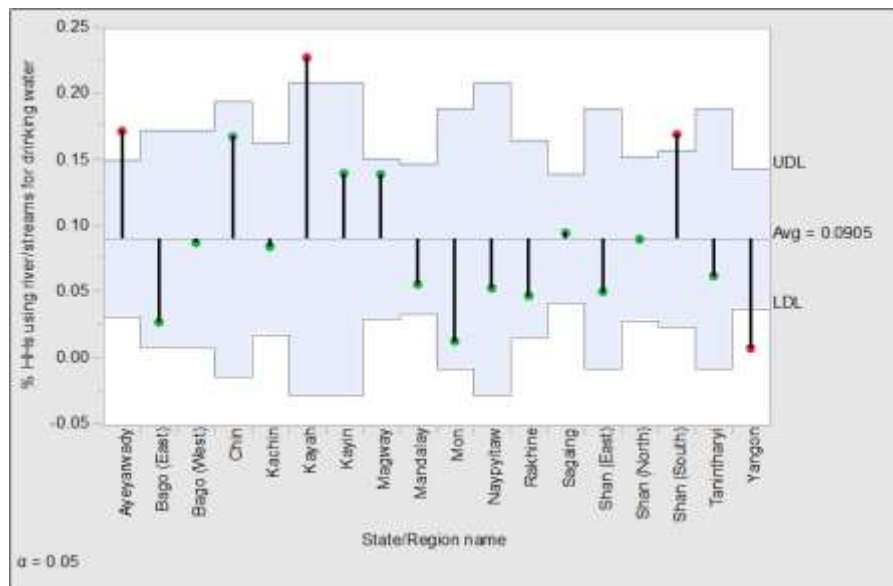
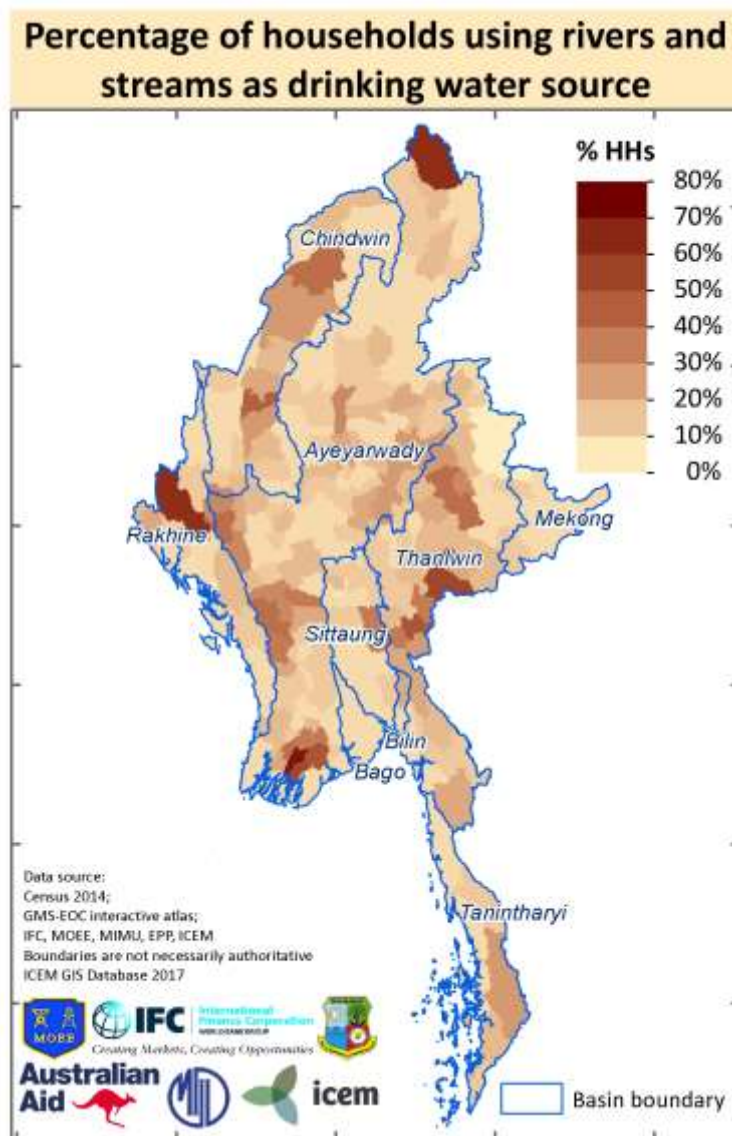


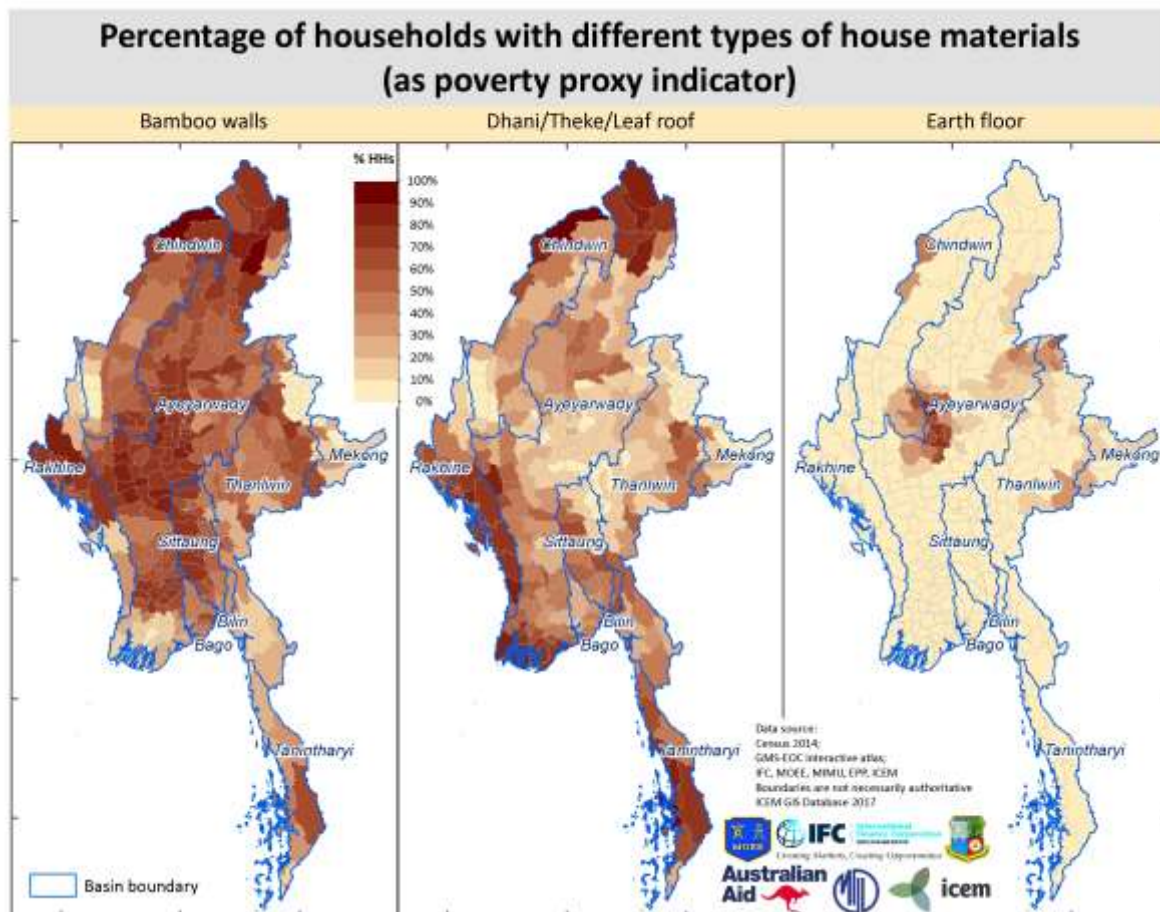
Figure 6.10: Percentage of households using rivers/streams for drinking water



House materials such as earth floors are used in multi-dimensional poverty indices as poverty proxy indicators (such as in the Multi-dimensional Poverty Index (MPI) by Oxford Poverty and Human Development Initiative (OPHI) <http://www.ophi.org.uk/wp-content/uploads/Myanmar1.pdf>). Earth floors, roofs made of leaves and bamboo walls are used as proxy indicators of poverty. The following is an analysis of distribution of households' house materials for roofs, floors and walls based on Census 2014 data. However, the traditional and cultural differences in building construction have not been taken into account here.

On average 50% in all Townships or a total of 5.57 million houses in Myanmar have bamboo walls. The highest percentages by State/Region are in Magway (median 78%), Mandalay (median 76%), Nay Pyi Taw (median 68%), Bago West (median 67%), Rakhine (median 66%) with Kachin and Sagaing following closely. Dhani/Theke/Leaf roofs are most common in Rakhine (median 74%), Tanintharyi (median 71%), Ayeyarwady (53%), and the remaining State/regions less than 45% (median) of the households. Earth floors are most common in Shan North (median 21%), Mandalay (16%), Sagaing (11%), and Shan East (10%). In the other State/Regions, less than 2% of the households on average have earth floors.

Figure 6.11: Proxy poverty indicators: house materials



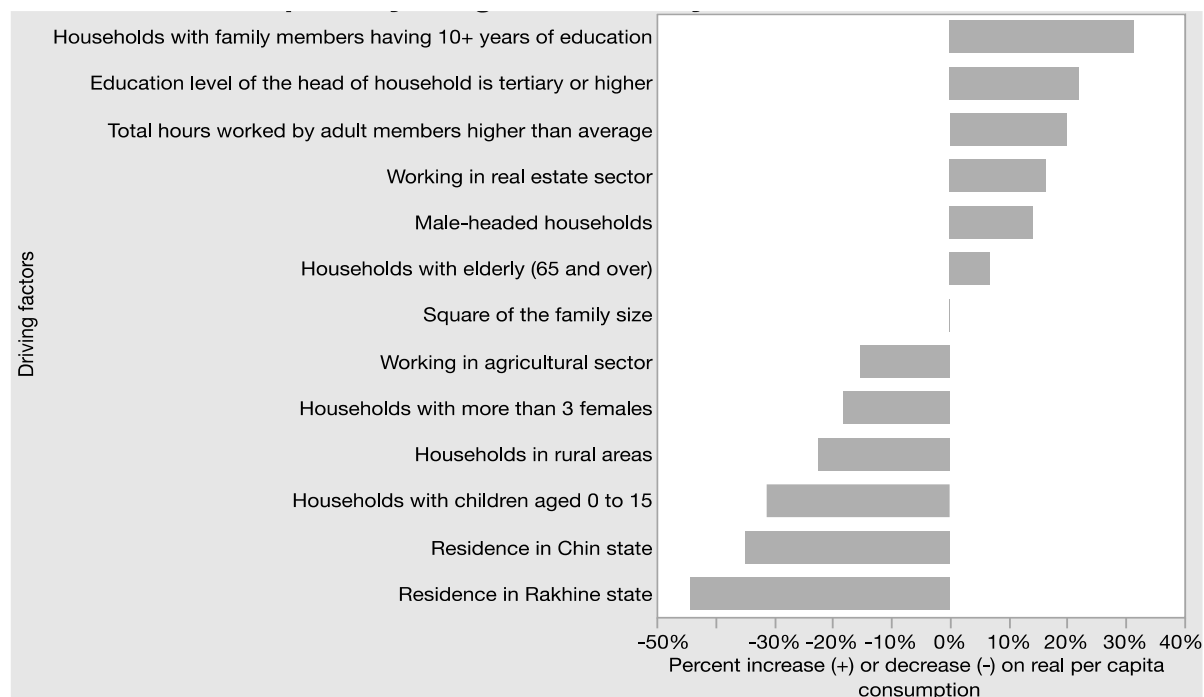
Data source: Census 2014

There is a slight statistically significant relationship between the status of potential impacts from hydropower and the percentage of houses that have bamboo walls (Figure 6.11). Townships that are potentially impacted by existing hydropower have a median of 60% of houses with bamboo walls, while the Townships potentially impacted by hydropower under construction have 45% of houses with bamboo walls. Townships not impacted have a median of 53% of the households with bamboo walls. For roof and floor materials there is no statistically significant relationship to Township status of potential hydropower impact. However, there may be a relationship to Townships potentially impacted by planned hydropower. The high frequency of use of these house materials reflect the high

poverty incidence found in the IHLCA discussed in previous sub-section while providing a more detailed picture of the distribution of this proxy poverty indicator in Townships across the country.

**Drivers of poverty:** A paper published by UNICEF in 2013 re-examined poverty data from IHLCA to identify through Regression analysis proximate causes of household poverty.<sup>23</sup> The report presents the data on drivers of poverty that are the basis for Figure 6.12. The analysis shows that higher incomes are associated with higher education, more work hours and male-headed households, while lower incomes are associated with location (ie living in Rakhine and Chin States and living in rural areas), households with small children, households with more than 3 females and working in the agricultural sector.

**Figure 6.12: Drivers of poverty based on analysis of data from IHLCA 2009-2010**



Data source: IHLCA 2010 re-analysed by A. Bonnerjee, in 'Social protection in Myanmar', UNICEF, 2013

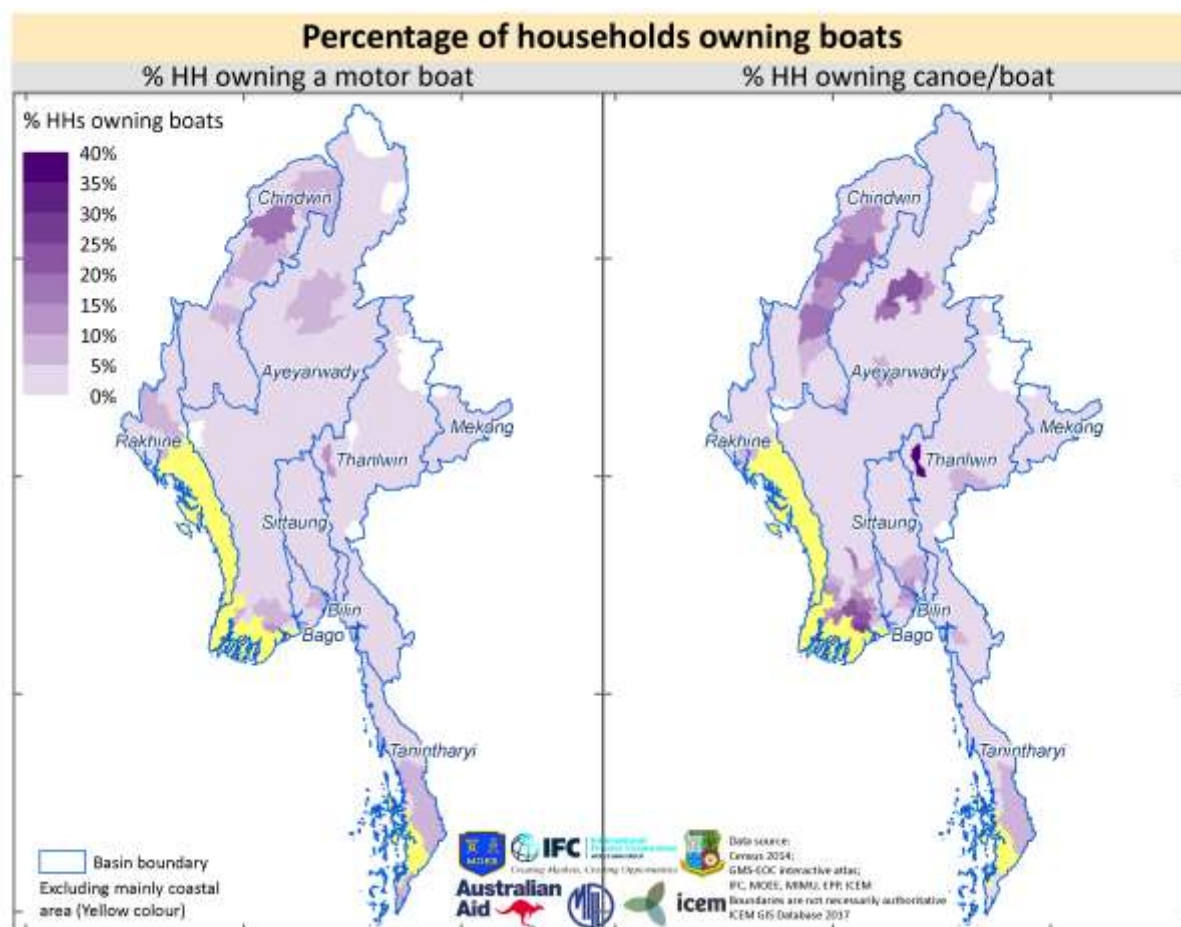
### 6.2.2 Ownership of boat as proxy indicator livelihood dependency on rivers

Detailed information about inland fishers and their locations would be an important indicator for dependency on river water resources for income and food security. In its absence, a proxy indicator for some degree of use and dependence on rivers is the proportion of households that own boats. The ownership to boats data points to the importance of inland rivers, lakes and wetlands for transport and livelihoods in general. The ownership to boats data points to the importance of inland rivers, lakes and wetlands for transport and livelihoods in general. Figure 6.13 shows the percentages of inland households that owns motor boats or boats and canoes. In total 197,000 households own a motorboat, with most in Ayeyarwady at 91,000 households, which also has the highest average percentage (by Township) of households owning boats at 6.4%. In Tanintharyi Region on average 5% of households in the Townships owns a motorboat, however due to the many islands in the region some of these may be in coastal areas. In total 376,000 households in inland regions own non-motorised boats or canoes. In Ayeyarwady 185,000 households, or on average 14% in the Townships, own a boat or canoe, while in Sagaing 38,000 households (4%) own a boat. In Bago East 5% on average, or 24,000 households own a boat or canoe.

<sup>23</sup> Aung, N., Bonnerjee, A., Goldman, P. and Roccella, C. (2013). *Social Protection In Myanmar: The Impact Of Innovative Policies On Poverty, Final Draft*. [online] UNICEF. Available at: [https://www.unicef.org/myanmar/Social\\_impact\\_study\\_version\\_2\\_\(Final\\_Draft\).pdf](https://www.unicef.org/myanmar/Social_impact_study_version_2_(Final_Draft).pdf).



Figure 6.13: Ownership to boats - proxy for dependence on rivers



Data source: Census 2014, excluding the main coastal areas (indicated by yellow colour)

**Trends in poverty:** The 2013 UNICEF report concludes that the characteristics of poverty in Myanmar mean that a modest benefit package can provide a transformative bridge for households to escape the cycle of inter-generational poverty.

For the present SEA, it is concluded that in the years to 2035, overall poverty is likely to decrease to levels comparable to other countries in South East Asia. The level of transitory poverty is likely to remain for the next 10 years, depending on the success of social protection programmes and economic and social policies about redistribution of wealth. Some underdeveloped areas are likely to remain, and urban poverty is likely to become more widespread and deeper as urbanization continues its rapid pace.

### 6.3 Food security

In 2011, a scoping study on food security information by FAO<sup>24</sup> observed that:

*“While Myanmar is generally ‘food secure’ at the national level, recent household food security assessments conducted by various agencies confirm that many poor households both in rural and urban areas still face the threat of food insecurity”*

As of 2017, there are indications that this is still the case. According to World Food Programme (WFP) 543,475 people were in need of food assistance in Myanmar in January 2017.<sup>25</sup> WFP reports that 35% of children under the age of five suffer chronic malnutrition.

<sup>24</sup> Shwe, T. (2011). *Scoping Study On Food Security And Nutrition Information In Myanmar*. [online] FAO. Available at: [http://www.themimu.info/sites/themimu.info/files/documents/Report\\_Food\\_Security\\_and\\_Nutrition\\_Information\\_Scoping\\_Study\\_EC\\_May\\_11.pdf](http://www.themimu.info/sites/themimu.info/files/documents/Report_Food_Security_and_Nutrition_Information_Scoping_Study_EC_May_11.pdf)



Most food security studies are emergency assessment with focus on specific areas with special needs at different times, for example for Northern Rakhine (2016-17), Southern Shan (2012), The Dry Zone (2011), Selected areas of Taunggyi, and across Wa (2010). The only baseline study is the Comprehensive Food Security and Nutrition Assessment (CFSVA) for Northern Rakhine State in 2009.

In 2011, a study by WFP indicated that only 59% of the population in the Central Dry Zone (CDZ) had a good/reliable source of food. Areas with poor access to land, poor physical access to markets, and low infrastructure development, had the highest rate of food insecurity<sup>26</sup>.

Thus large part of rural Myanmar is still vulnerable to food insecurity especially caused by natural disasters.

**Trend in food security:** With increased access to markets and interconnectivity food security is likely to improve. In the longer term food insecurity is likely to decrease

#### **6.4 Flooding and landslides impacts on livelihoods**

A recent mapping of areas that are potentially vulnerable to periodic flooding show that most of Myanmar is potentially vulnerable (Figure 6.14 & Figure 6.15). Over the period 1936-2016 flooding accounted for 78% of the internationally reported number of affected people from disasters in Myanmar. Between 1970 and 2016, 12.4 million people were affected by floods, and of these 11.2 million were affected by riverine floods in 15 such events (Table 6.8).<sup>27</sup>

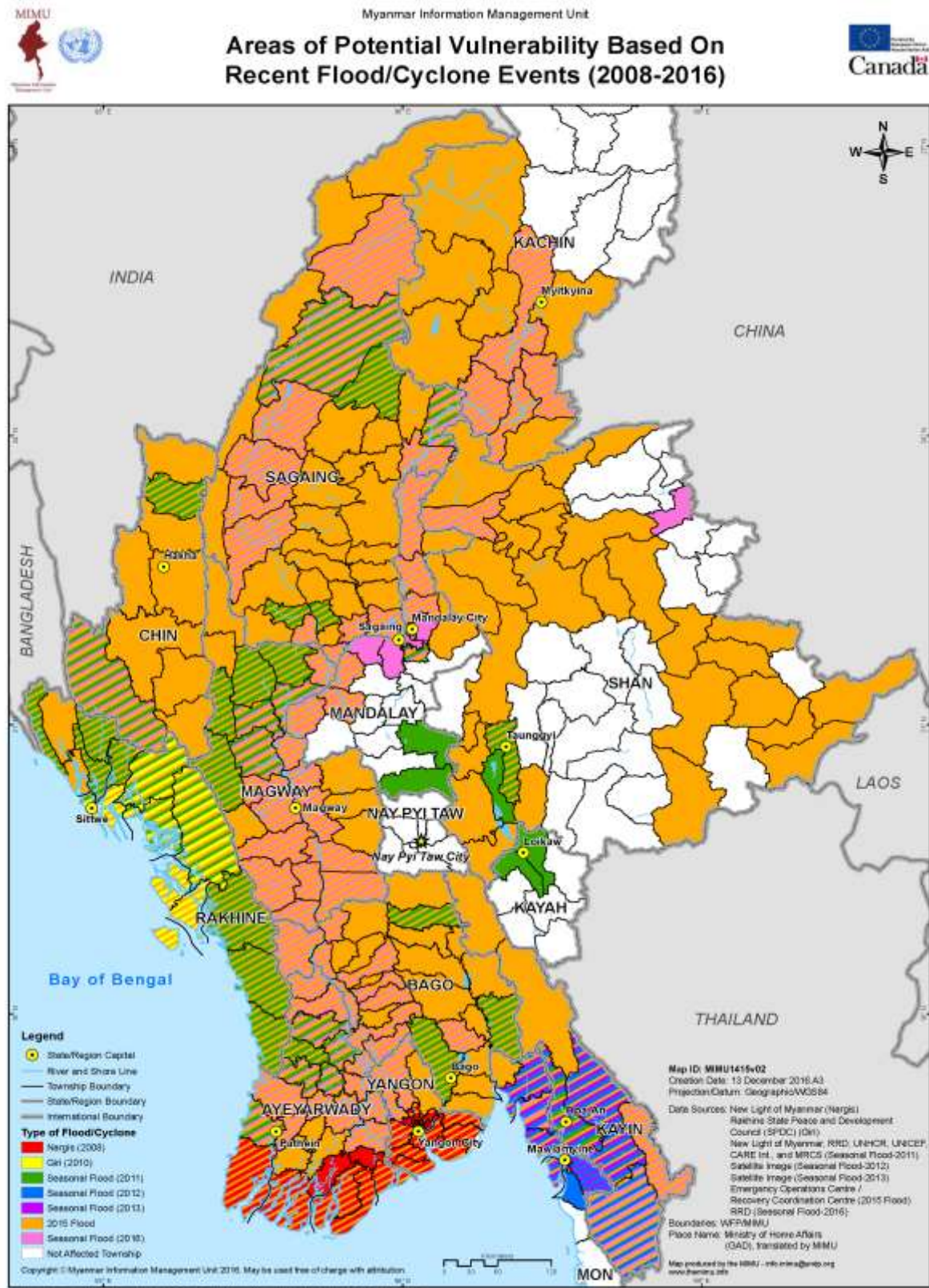
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<sup>25</sup> Myanmar Country Brief. (2017). [online] Documents.wfp.org. Available at: [http://documents.wfp.org/stellent/groups/public/documents/ep/wfp273246.pdf?\\_ga=1.262407180.1025890488.1480590359](http://documents.wfp.org/stellent/groups/public/documents/ep/wfp273246.pdf?_ga=1.262407180.1025890488.1480590359).

<sup>26</sup> Poe, C. (2011). *Food Security Assessment in the Dry Zone, Myanmar*. [online] Food Security Analysis Services (ODXF), WFP. Available at: <http://documents.wfp.org/stellent/groups/public/documents/ena/wfp234780.pdf?iframe>.

<sup>27</sup> Myanmar - Disaster & Risk Profile | PreventionWeb.net. (2017). [online] Preventionweb.net. Available at: <http://www.preventionweb.net/countries/mmr/data/>.

Figure 6.14: Areas of potential vulnerability of flooding



A recent example of the scale of flooding is the 2015 monsoon and cyclone Komen. Widespread flooding occurred across 12 of the 14 states and regions (Ayeyarwady, Bago, Chin, Kachin, Kayin, Magway, Mandalay, Mon, Rakhine, Sagaing, Shan, Yangon). Especially Chin and Rakhine States, and Sagaing, Magway and Bago Regions were severely impacted by floods and landslides from torrential rains that were followed by cyclone Komen, which brought strong winds and additional

rains. The combination of heavy rainfall, high soil saturation, and unstable soils in hilly areas caused widespread and devastating landslides.

Up to 5.2 million people were exposed to heavy floods, strong winds and landslides in the 40 most heavily affected townships half of which were in the two poorest states in Myanmar: Rakhine and Chin. The World Bank reports that an estimated 1.6 million people were displaced from their homes and 132 lost their lives - and the cost of destruction was equivalent to 3.1% of Myanmar's gross domestic product (GDP) in 2014/2015. In 2015/2016, GDP growth could drop by 0.8% without adequate recovery efforts. The hardest hit sectors include agriculture, livestock, fisheries, and housing (525,000 houses were impacted), accounting for about 90% of total disaster losses. The Department of Fisheries recorded damage to 13,578 hectares of fishponds. According to the Livestock and Veterinarian Department almost 23,000 hectares of shrimp ponds were damaged, 99 percent of which were in Rakhine (Table 6.6 & Table 6.7).<sup>28</sup> Overall, 20% of cultivated areas were damaged, equivalent to 4.2% of agricultural GDP.<sup>29</sup> A state of emergency was declared in Sagaing, Magway, Chin, and Rakhine. Due to the disaster it is expected that at least 9.4 million workdays were lost, along with US\$16.9 million in personal wage income (Refer to Table 6.5 for details)<sup>30</sup>.

**Table 6.5: Poverty proxy indicators: house materials**

Region	Poverty proxy indicator		
	Bamboo walls	Dhani/Theke/Leaf roof	Earth floor
	Mean % of Township Households		
Ayeyarwady	36.2%	56.3%	0.5%
Bago (East)	61.7%	46.4%	1.3%
Bago (West)	65.2%	34.5%	1.7%
Chin	31.9%	22.5%	0.4%
Kachin	67.3%	45.2%	4.6%
Kayah	38.4%	26.5%	0.4%
Kayin	26.9%	36.1%	0.6%
Magway	70.9%	36.1%	5.6%
Mandalay	71.6%	14.4%	24.9%
Mon	24.4%	39.5%	0.4%
Naypyitaw	63.8%	24.4%	1.2%
Rakhine	58.2%	70.9%	1.2%
Sagaing	65.3%	37.0%	22.9%
Shan (East)	35.1%	28.4%	12.7%
Shan (North)	53.6%	21.4%	22.8%
Shan (South)	47.2%	17.4%	2.5%
Tanintharyi	35.7%	67.7%	1.2%
Yangon	22.8%	14.3%	0.4%
<b>All</b>	<b>50.5%</b>	<b>33.4%</b>	<b>8.0%</b>

<sup>28</sup> World Food Programme, (2016). , *Special Report, FAO/WFP Crop and Food Security Assessment, Mission To Myanmar*. [online] FAO/WFP. Available at: <https://www.wfp.org/content/special-report-faowfp-crop-and-food-security-assessment-mission-myanmar>.

<sup>29</sup><http://www.worldbank.org/en/country/myanmar/publication/myanmar-floods-and-landslides-post-disaster-needs-assessment>

<sup>30</sup> Republic of the Union of Myanmar, (2016). *Myanmar Flood and Landslides Emergency Recovery Project, Environmental and Social Management Framework (ESMF)*. Available at: <http://reliefweb.int/disaster/fl-2015-000080-mmr>.

**Table 6.6: Effects of flooding on monsoon paddy area and yield in 2015 compared with 2014**

State/Region	Consequences of flooding
<b>Kachin</b>	Area down marginally. Some loss of planted area to flooding, but very little. Ongoing political instability has also contributed to a small area reduction. Yields increased slightly due to better rainfall.
<b>Kayah</b>	Area decreased marginally and yields are also estimated to have decreased slightly due to well-below average rains throughout most of the growing season. (Not visited by the Mission.)
<b>Kayin</b>	Small paddy area cuts due to standing water in the fields for 2-3 weeks following floods. Transplanting was delayed by about two weeks due to late monsoon rains. Yields are estimated to have increased marginally, compensating for the small contraction in plantings. Increased mechanization, 50 percent of paddy is harvested by combine harvesters, led to higher yields this season.
<b>Chin</b>	Paddy planted area and yields were both reduced by floods. Increasing population pressure on the slash-and -burn cropping system that is widespread in Chin State, the average intervals between cultivations in the same field have decreased in recent decades from 15 to 7 years, with consequent declines in soil fertility and crop yield.
<b>Sagaing</b>	Most of the flooded area has been replanted. Harvested paddy area in 2015 remained similar to the harvested area in 2014, while yield increased marginally because of better rainfall. The region produces high-quality rice.
<b>Tanintharyi</b>	A marginal increase in yields according to MoAI. (Not visited by the Mission.)
<b>Bago</b>	Paddy area and yield in Bago East were both reduced slightly by floods. This was partly offset by a slight increase in yield in Bago West as a result of better rainfall.
<b>Magway</b>	Paddy area reduced as floods damaged nurseries. A slight increase in yields on account of better water conditions is expected to largely compensate for the area cuts. The DoA wishes to increase the area of summer paddy but will probably be constrained by the limited amount of available irrigation water.
<b>Mandalay</b>	The area under monsoon paddy decreased, mainly because farmers, aware of climate change and increasingly unreliable rainfall in the central dry zone, are switching to other crops. Yield are also expected to decrease slightly due to well below-average rains throughout most of the season, although better water irrigation supplies in some areas offset possible further yield decreases.
<b>Mon</b>	No change reported. (Not visited by the Mission.)
<b>Rakhine</b>	20 percent of the state's paddy fields were damaged by floods; of these, 50 percent were replanted, but not all is expected to be harvestable. (Official DoA figures suggest that 99 percent of the flood-damaged area was replanted but this does not tally with Mission observations, farmer interviews or the estimate of the Myanmar Rice Federation.) Some of the replanted paddy, having been replanted late in the season, is likely to give low yields.
<b>Yangon</b>	Despite extensive replanting of paddy following flood damage, there were some reduction in harvested area and a slight yield reduction.
<b>Shan</b>	Slight area reduction and a small decrease in yields from flood damage.
<b>Ayeyarwady</b>	Extensive flooding occasioned up to two re-plantings. By September many farmers replanted with black gram, cowpea or maize instead of paddy. Paddy area and yield both reduced.
<b>Union Territory</b>	A slight increase in area planted. Yields unchanged. No change reported. (Not visited by the Mission.)

Source: FAO/WFP Crop and Food Security Assessment mission to Myanmar, Special Report, 16 March 2017.

**Table 6.7: Myanmar - Livestock losses as a result of flooding 2015 cyclone Komen**

State/Region	Bovines	Goat/Sheep	Pig	Chicken	Duck	Horse
Kachin	6					
Kayah						
Kayin						
Chin	91	67	99	890		55
Sagaing	369	26	870	95 371		
Tanintharyi						
Bago			15			
Magwe	129	215	442	15 490	255	
Mandalay	31					
Rakhine	5 309	2 665	3 178	9 745	2 200	
Yangon			7	43 257	45	
Shan	13		57	1 453	90	
Ayeyarwaddy	25	5	637	69 778		
<b>Total</b>	<b>5 973</b>	<b>2 978</b>	<b>5 305</b>	<b>235 984</b>	<b>2 590</b>	<b>55</b>

Source: Livestock and Veterinarian Department and CSO

Further, the World Bank assessment found that the floods and landslides triggered widespread decline in the quality of life for the disaster-affected population, especially for more vulnerable population groups like women, children and the elderly.

**Table 6.8. Impacts from flooding, landslides and storms 1970-2016<sup>31</sup>**

Disaster type	Disaster subtype	Events count		Total deaths		Total affected	
		Sum	Column %	Sum	Column %	Sum	Column %
Flood	--	8	18%	137	0%	1,101,655	7%
	Flash flood	4	9%	279	0%	85,734	1%
	Riverine flood	15	33%	251	0%	11,202,690	72%
	All	27	60%	667	0%	12,390,079	79%
Landslide	Landslide	7	16%	205	0%	147,582	1%
	All	7	16%	205	0%	147,582	1%
Storm	Convective storm	3	7%	29	0%	125,444	1%
	Tropical cyclone	8	18%	138,909	99%	2,998,125	19%
	All	11	24%	138,938	99%	3,123,569	20%
<b>All</b>	<b>All</b>	<b>45</b>	<b>100%</b>	<b>139,810</b>	<b>100%</b>	<b>15,661,230</b>	<b>100%</b>

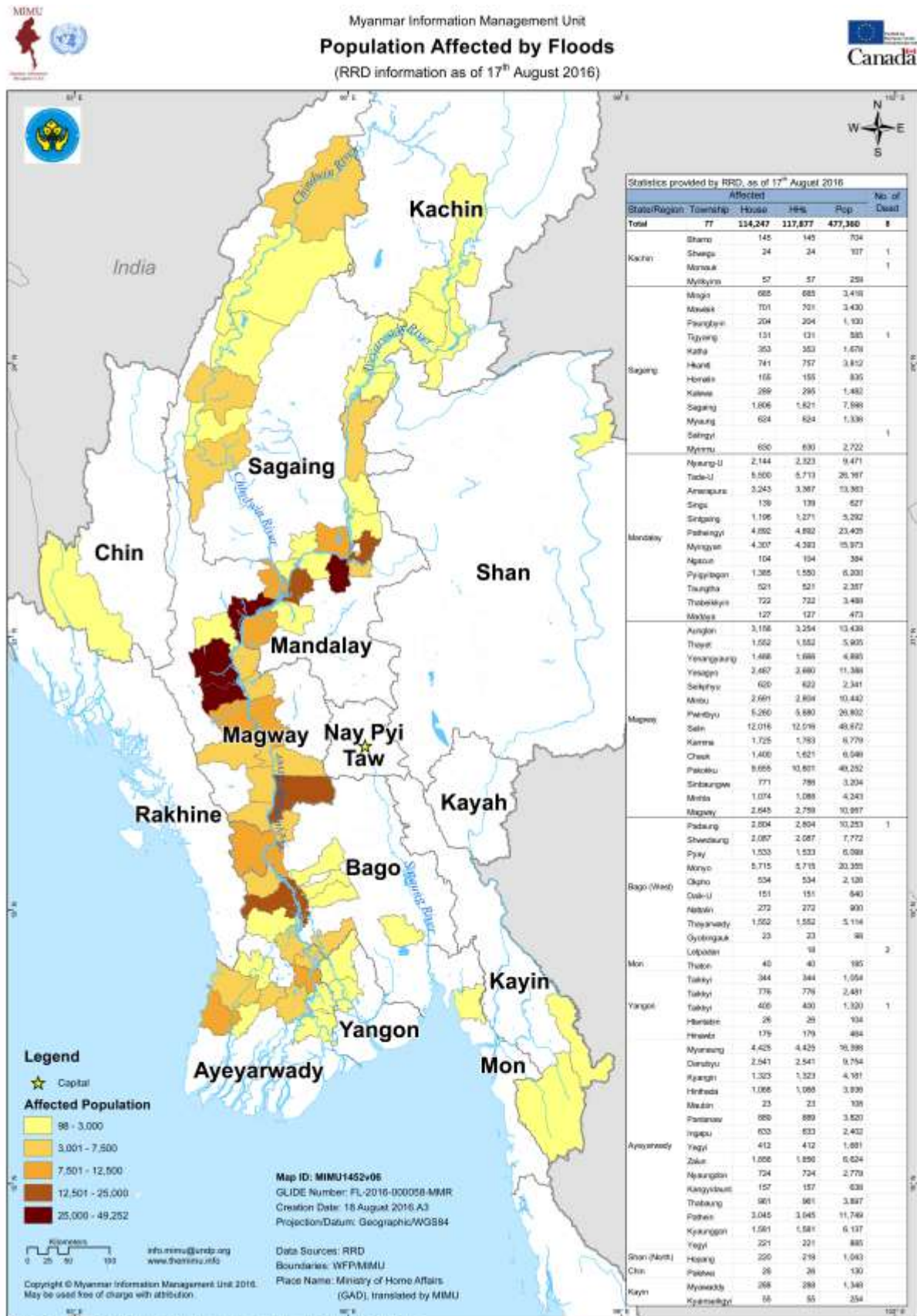
**Drivers:** Unless land use policies restrict development of flood plains, and forestry policies restrict deforestation, impacts of flooding events are likely to increase in severity.

**Trend:** Generally speaking it can be assumed that climate change is likely to cause more severe extreme weather events. Disaster preparedness measures, if such are implemented, are likely reduce the impacts.

<sup>31</sup> Country profile - Myanmar. (2016). [online] The International Disaster Database. Available at: [http://www.emdat.be/country\\_profile/index.html](http://www.emdat.be/country_profile/index.html).



Figure 6.15: Population affected by floods 2016 (MIMU)





## 6.5 Social protection

An inventory of social protection programs by the World Bank done in 2013 shows that social protection is not a new concept in Myanmar. There is a wealth of schemes, although these are small in scale, particularly when it comes to social assistance (Box 6.1). So far, government-implemented social assistance programs have been few, small, and underdeveloped and thus are far from providing a comprehensive safety net in the country.<sup>32</sup>

**Box 6.1: Social protection programmes in Myanmar 2013**

Early childhood (Equity and opportunity)	School-age children (Equity and opportunity)	Working-age population (Equity and resilience)	Old age (equity and resilience)	All age groups (Opportunity, equity and resilience)
<ul style="list-style-type: none"> <li>• Institutional care for orphans (MSWRR)</li> <li>• Support for triplet and greater sets of newborns (MSWRR)</li> <li>• Early childhood development programs (MOE)</li> <li>• Maternal and child health vouchers (MOH)</li> <li>• Provision of food and micronutrient supplements for pregnant and lactating mothers, fortified food for children (MOH/WFP)</li> <li>• Community case management of illness (UNICEF)</li> <li>• Cash transfers (SC)</li> </ul>	<ul style="list-style-type: none"> <li>• Stipends, scholarships, supply of textbooks (MOE)</li> <li>• School supplies and access to education for vulnerable children (UNICEF)</li> <li>• School-feeding (WFP)</li> </ul>	<ul style="list-style-type: none"> <li>• Social security for formal workers and government employees (MOLESS)</li> <li>• Employment services for migrant workers (MOLESS)</li> <li>• Voluntary homes for women (MSWRR)</li> <li>• Food and cash for work (WFP)</li> <li>• Cash for work and other livelihood programs for vulnerable communities (LIFT and partners, ILO)</li> <li>• Migration centers (MOLESS/IOM, ILO)</li> </ul>	<ul style="list-style-type: none"> <li>• Pensions for formal workers and government employees (MOLESS, MOF)</li> <li>• Voluntary homes for the elderly (MSWRR)</li> <li>• Pensions for over 100 year olds (President's Office)</li> <li>• Support to old people self-help groups (MSWRR/HAI)</li> </ul>	<ul style="list-style-type: none"> <li>• Care for people with disabilities (MSWRR)</li> <li>• Welfare services for people with leprosy (MSWRR)</li> <li>• Rice donations to homes (MSWRR)</li> <li>• Cash and in-kind emergency support after disasters (MOBA, MSWRR, WFP, SC, others)</li> <li>• Cash and in-kind support to internally displaced people (WFP and partners, HAI)</li> </ul>

*Reference: Building Resilience, Equity and Opportunity in Myanmar: The Role of Social Protection. Inventory of social protection programs in Myanmar, by Mariana Infante-Villarreal, with contributions from Puja Vasudeva Dutta, Hnin Hnin Pyne, Reena Badiani-Magnusson, Yuko Okamura, and Khin Aye Yee, World Bank. Social Protection Notes series, July 2015.*

In a report from 2014, UNICEF observed that social protection interventions in Myanmar have been minimal and fragmented<sup>33</sup>. In December 2014, the government launched Myanmar National Social Protection Strategic Plan, which aims to build integrated social protection services throughout the population.

**Drivers:** Social protection is driven by identified vulnerabilities of the population and the political philosophy of the government. The National Social Protection Strategy recognizes that a new poverty, risk and vulnerability profile for Myanmar is necessary. The strategy identifies vulnerabilities with direct linkages to hydropower development including significant environmental risks, which have a direct bearing on social protection. These have been assessed in the country's Hazard Profile and

<sup>32</sup> Infante-Villarreal, M. (2015). *Building Resilience, Equity and Opportunity in Myanmar: The Role of Social Protection. Inventory of social protection programs in Myanmar*. Social Protection Notes series. [online] The World Bank. Available at: <http://documents.worldbank.org/curated/en/729301467991961477/Building-resilience-equity-and-opportunity-in-Myanmar-The-role-of-social-protection-overview>.

<sup>33</sup> Aung, N., Bonnerjee, A., Goldman, P. and Roccella, C. (2013). *Social Protection In Myanmar: The Impact Of Innovative Policies On Poverty, Final Draft*. [online] UNICEF. Available at: [https://www.unicef.org/myanmar/Social\\_impact\\_study\\_version\\_2\\_\(Final\\_Draft\).pdf](https://www.unicef.org/myanmar/Social_impact_study_version_2_(Final_Draft).pdf).

Myanmar Action Plan for Disaster Risk Reduction, and include: storm surge, flood, drought, earthquake and landslides. Other vulnerabilities include under- and malnutrition, trafficking/migration and vulnerability during disasters.

## 6.6 Gender

In 2012 Myanmar had a Gender Inequality Index (GII) value of 0.437, ranking it 80<sup>th</sup> out of 148 countries (UNDP 2013). The 2013 Gender Inequality Index ranked Myanmar 83<sup>rd</sup> of 187 countries<sup>34</sup>, while the 2012 Social Institutions and Gender Index placed the country 44<sup>th</sup> of 86 countries, and 8<sup>th</sup> of nine countries in East Asia and the Pacific.<sup>35</sup>

A situation analysis of 2016 by ADB et al<sup>36</sup> observes that:

*“Myanmar, as in many other countries, has a mixed narrative on gender equality and women’s rights. Its progress lays a strong foundation for greater advancement, largely attributable to the combined efforts of government, quasi-government organizations, civil society groups, and development partners. There are also major challenges, which include contradictory messages in the legal framework, the plural legal system with different gender equality and women’s rights standards, policy-practice deficits, gaps between sectors (education versus leadership and political participation), highly skewed results within a sector (such as education), and contradictory trends between related sectors (such as education and employment)”*

A gender assessment done by Save the Children in Myanmar stated that women are most affected by hunger and food insecurity.<sup>37</sup>

In Myanmar, as in most countries, women and men are paid differently for the same work. In 2015, as daily wage earners urban men got 6.58 US\$, urban women averaged 4.52 US\$. In rural areas men averaged 4.7 US\$, while women only got 2.65 US\$ as daily wage.<sup>38</sup>

Women make up only around 10% of Union parliamentarians, and in state and region parliaments women have 12.7% of elected seats, compared to just 3.8 percent in the 2010 elections. However, including military appointees men make up around 90 percent of MPs in these bodies. There are no women MPs in three State/Region parliaments. The study by Asia Foundation from which these data come concluded “the low level of female participation also acts as a barrier to more effective and equitable policymaking, budgeting, and public service delivery”.<sup>39</sup>

**Fertility rate:** Fertility rate is the average number of children women has when they are between 15 and 44 years of age.<sup>40, 41</sup> In 2010-15, the fertility rate in Myanmar was 1.94, lower than the average for Southeast Asia, and comparable to Thailand and Vietnam. It is projected to decrease even further to around 1.5 in year 2045 (Figure 6.16).<sup>42</sup>

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<sup>34</sup> Gender Inequality Index | Human Development Reports. (2017). [online] Hdr.undp.org. Available at: <http://www.hdr.undp.org/en/content/gender-inequality-index>.

<sup>35</sup> Organisation for Economic Co-operation and Development (OECD), (2012). *Social Institutions and Gender Index: Understanding the Drivers of Gender Inequality*. Paris: OECD Development Centre.

<sup>36</sup> ADB, UNDP, UNPF, the United Nations Entity for Gender Equality and the Empowerment of Women., (2016). *Gender Equality and Women’s Rights in Myanmar: A Situation Analysis*. [online] Available at: <https://openaccess.adb.org>. Available under a CC BY-NC-ND 3.0 IGO license.

<sup>37</sup> Citation from: LIFT Gender Strategy. (2012). [online] LIFT. Available at: <http://www.lift-fund.org/lift-gender-strategy>.

<sup>38</sup> Zainudeen, A. and Galpaya, H. (2015). : *Mobile phones, Internet, and gender in Myanmar, Report of a joint GSMA Connected Women-LIRNEasia study*. [online] GSM Association. Available at: <http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/02/Mobile-phones-internet-and-gender-in-Myanmar.pdf>.

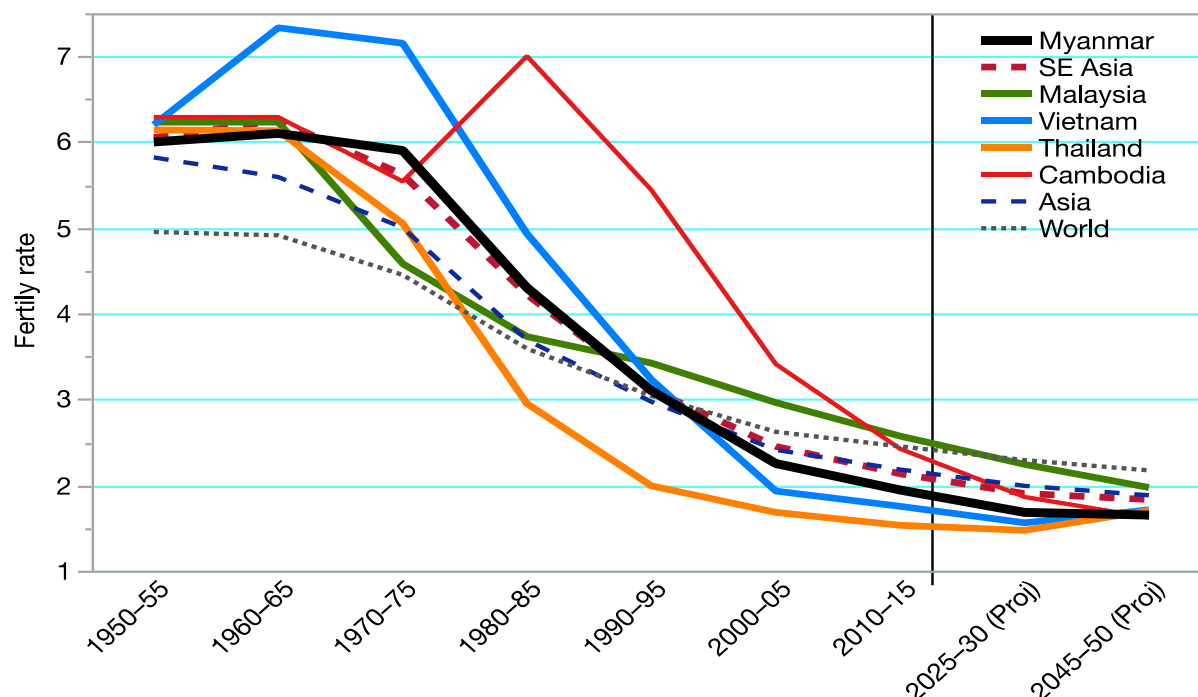
<sup>39</sup> Minoletti, P. (2016). *Gender (in) Equality in the Governance of Myanmar: Past, Present, and Potential Strategies for Change*. [online] Asia Foundation. Available at: [http://asiafoundation.org/wp-content/uploads/2016/05/MM-Gender-Paper\\_EN.pdf](http://asiafoundation.org/wp-content/uploads/2016/05/MM-Gender-Paper_EN.pdf).

<sup>40</sup> Fertility rate is a strong indicator of family structure and of women’s equality and participation in society. More than other demographic indicators, fertility levels and trends ‘encapsulate the mentality and behaviours of a large collection of individuals. As such, they reflect the collective psyche and common attitudes towards modernization, versus tradition (Courbage 2015).

<sup>41</sup> Courbage, Y. (2015). The political dimensions of fertility decrease and family transformation in the Arab context. *DIFI Family Research and Proceedings*, 2015(1), p.3.

<sup>42</sup> Health Nutrition and Population Statistics: Population estimates and projections| World DataBank, 2017

Figure 6.16: Myanmar fertility rate, past and projected, compared to other countries



Data source: World DataBank

The average house-holds size varies significantly between State/Regions, indicating the different pace of modernization that takes place in the ethnic areas and cultures.

**Female-headed households:** Female-headed households are considered more vulnerable to shocks than male-headed households. For example, female-headed households are amongst those most affected by food insecurity (Poe, 2011).

In Myanmar, female-headed households are likely to have only one, or fewer adult household members than male-headed households. However, the relationship between poverty and household head is complex and the data presented here must be thought of as a proxy indicator for vulnerability. Work related migration and displacement influence the number of female-headed households in a particular location, and migration may not be directly linked to poverty.

In 2013, a gender focused study by IHLCA covering 2009-2010 found that 80% of Myanmar households were headed by a male and 20% by a female; in 72% of them, the head was widowed. The Census 2014 found that 23% of all households are female-headed households. IHLCA found 13% of female-headed households had adult males, and these households were similar to male-headed households in terms of household size, composition, resources and well-being. However, the 7% of female-headed houses with no adult males were different, with fewer resources and diverse income sources. IHLCA also pointed to regional differences, possibly due to high levels of male out-migration from some areas or higher levels of civil unrest that forced men away from their home.

Figure 6.17 shows the percentage of female-headed households by Township from Census 2014. The percentages vary from 50% to 5% in Townships across the Union. The average percentage by State/Region varies from 13% in Shan East to 30% in Tanintharyi, with the national average at 23% (Table 6.9).

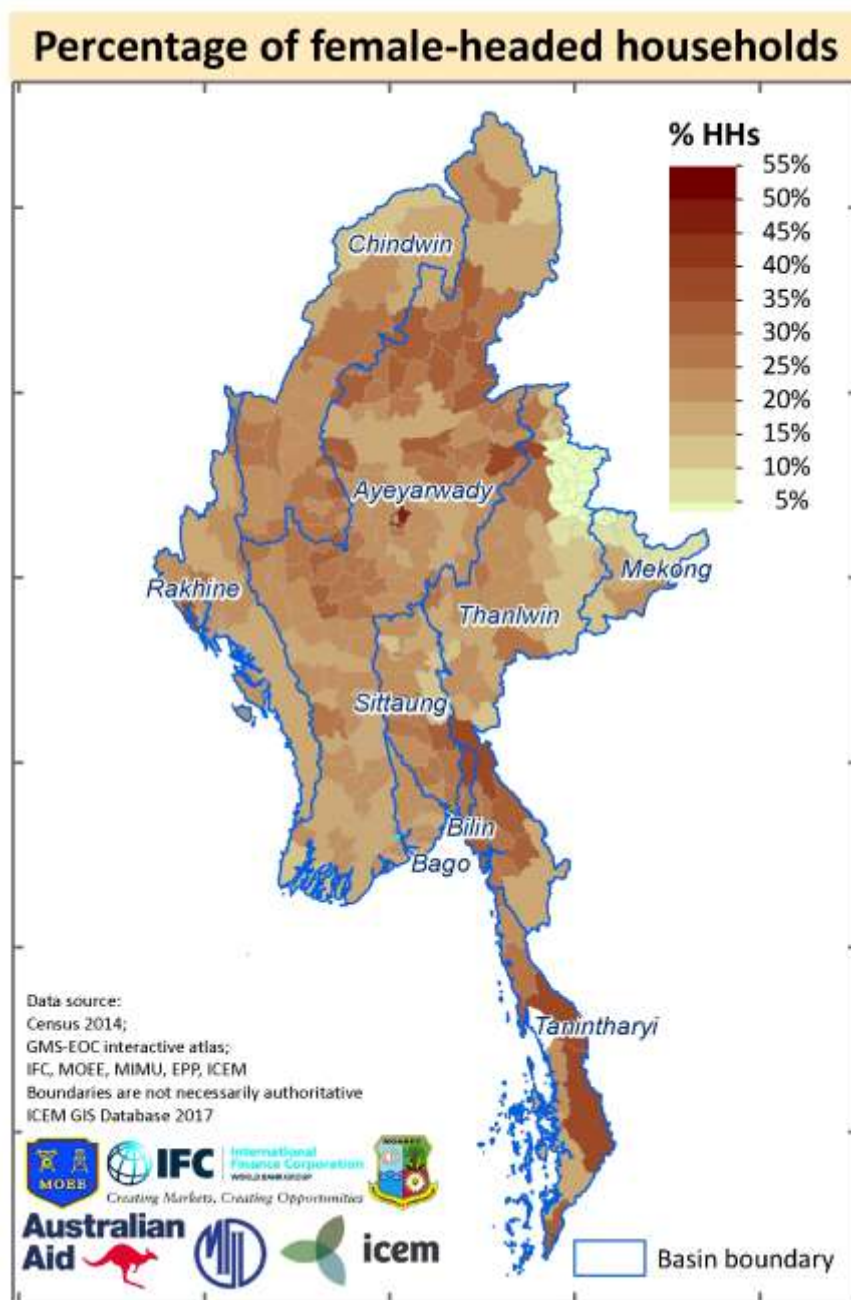
Table 6.9: Mean per cent of female-headed households in townships by State/Region

State/Region	Female- headed households (%)		Mean household size
	Mean		Mean
Ayeyarwady	19.3		4.0
Bago (East)	25.2		4.5
Bago (West)	21.0		3.8

State/Region	Female- headed households (%)	Mean household size
	Mean	Mean
Chin	23.0	5.2
Kachin	24.1	5.3
Kayah	20.5	4.7
Kayin	26.1	4.8
Magway	24.0	4.1
Mandalay	25.6	4.4
Mon	28.6	4.6
Nay Pyi Taw	21.3	4.1
Rakhine	23.3	4.4
Sagaing	24.3	4.7
Shan (East)	13.3	4.9
Shan (North)	20.8	5.1
Shan (South)	21.1	4.5
Tanintharyi	30.2	4.8
Yangon	26.1	4.4
<b>All</b>	<b>23.4</b>	<b>4.5</b>

Source: Census 2014

Figure 6.17: Percentage of female-headed households by Township



**Gender aspects of poverty:** The sex-disaggregated data on poverty are very limited. Currently, poverty is measured at the household level. In 2012, female participation in the labour market was 75% compared to 82% for men. Women usually work longer hours and have less leisure than men. They are generally relegated to the lower ranks of workers in either the formal or informal sectors (UNDP 2013). Research in the Central Dry Zone (CDZ) found that on average 45% of income earners in interviewed households were female (Poe, 2011).

An analysis of the 2009-2010 IHLCA data revealed gender differentials for some indicators (Table 6.10), where the largest difference was in labour force participation rate with men at 82% and women at 47%. Net enrolment rate in primary school was lower for women at 89% than men at 96%. However, women's literacy rate was slightly higher at 76.5% than men's at 73%.

Further analysis of the gender dimensions of the IHLCA data also found that in terms of education, female-headed households with no adult males had an enrollment ratio that was 10% lower than

households with adult males. Within those households, the enrollment ratio for males was somewhat larger than for females.<sup>43</sup>

**Table 6.10: Gender Disparities by Socioeconomic Characteristics, 2010**

Characteristics/Indicators (2010, unless specified)	Percent of	
	Male	Female
Proportion of population in agriculture, hunting, and forestry	52.3	47.4
Proportion of population as casual labourer	19.0	16.6
Proportion of population as employer	6.4	4.1
Proportion of agriculture households with access to credit	33.2	32.0
Proportion of non-agriculture households with access to credit	11.0	11.4
Labour force participation rate: previous 6 months (among persons 15 years and older) (2014 census data)	81.7	47.1
Underemployment rate: previous 7 days (among persons 15 years and older)	1.5	1.9
Proportion of population with self-reported morbidity incidence	34.9	41.0
Proportion of malnourished children younger than 5 years (weight or age)	4.9	5.9
Proportion of 1-year-old children immunized against measles	31.7	32.3
Proportion of 1-year-old children immunized against tuberculosis	81.5	83.0
Proportion of 1-year-old children immunized with three doses of DPT vaccine (%)	86.8	87.5
Adult literacy rate	72.9	76.5
Net enrolment rate in primary school	95.6	89.3
Net enrolment rate in secondary school	87.8	87.6

*Source: Unless specified: Integrated Household Living Conditions Survey 2009-2010. Cited from (ADB, UNDP, UNPF, the United Nations Entity for Gender Equality and the Empowerment of Women, 2016)*

**Impacts of flooding on women:** A special report by FAO on the impacts of the 2015 floods found that most of the poorest women relied on the demand for agricultural casual labour, which was reduced in the affected areas. Mainly due to increased transport costs due to the floods, prices of food commodities rose, which combined with economic hardship in affected communities, resulted in reduced demand. This impacted many women food traders in local markets. Women borrowed food and seeds from local markets, or borrowed from moneylenders at high interest rates (10% or higher), if they did not have pre-existing debts, which excluded them from that option (World Food Programme, 2016).

**Drivers:** Prescribed gender roles by culture and religion that men are expected to be the family head, responsible for breadwinning, and taking the lead on matters outside the home are two key drivers in maintaining gender inequities. Also, there is a widespread lack of awareness of the relevance of gender issues. Participation in the governance of Myanmar remains highly gender unequal, from the Union level to the village tract and village levels. It is likely that gender inequality contributes to inequitable decision-making and limits women's agency and well-being.

However, access to "modern" influences through mobiles and social media is challenging traditional gender roles. Changing work environments requiring greater flexibility and mobility are also having an impact on gender roles.

**Trends:** The decreasing fertility rate, modern influences through media, urbanization, and changing work environments is likely to lead to higher participation by women in the work force and in public life, and less gender inequality.

<sup>43</sup> Desai, J. (2013). *The Gender Dimensions of Living Conditions in Myanmar, Yangon. A gender analysis of two Integrated Household Living Conditions Surveys, in 2004-2005 and 2009-2010, cited from (ADB, UNDP, UNPF, the United Nations Entity for Gender Equality and the Empowerment of Women, 2016)*



## 6.7 Access to selected services

Good access to public services is one of the main objectives of development in general. Hydropower can contribute to improve access to services directly through electricity provision and local benefit sharing and, for example, by providing better roads to remote areas.

This section provides an overview of access to electricity and ICT services in Townships through a number of maps based on Census 2014 data. Reliable time series data are not available. The mean percentages of households with access to services are aggregated by Townships potentially impacted by existing hydropower and hydropower under construction, and those not impacted. Further, this section presents findings from a preliminary Poverty and Social Impact Assessment (PSIA) of Myanmar National Electrification Project funded by The World Bank in 2015.<sup>44</sup>

### 6.7.1 Access to electricity

Up to 2015, electricity provision has been through the “Self-Reliant Electrification Approach” (SRE). Communities, i.e., Wards and Villages are expected to raise their own funds to connect to the Government’s electricity grid. There has been no financial support to gain access. Thus access in rural areas is limited by the current coverage of the grid, and because villages must cover the costs of the grid to village connection.

The connection cost is a barrier to rural access to electricity. Even in villages that are connected to the grid, a high percentage of the households do not have electricity. The fees associated with connections are not affordable for these households. The PSIA cites a study that found that the SRE approach tends to exclude poor villages and households from the planning of local electricity connections as local leaders assume they are not able to pay. The personal relations, which Village leadership has with Townships and regional Electricity Supply Enterprise (ESE) offices seems to play a big role in whether a village or ward has grid electricity. The PSIA found one example from Shan where a large private hydropower company linked to the Shan dominated village administration provided initial credit and installment payments for connecting to the Shan households, whereas households belonging to the ethnic group Palong in the same village did not receive that opportunity and were not connected.

Compared to statistics on the number of villages and wards that are electrified, the household level Census data on the use of electricity for lighting and cooking gives a truer picture of the actual electrification rate. According to Census 2014, 31% of the households in Myanmar used grid electricity for lighting, and 15% for cooking. The proportion of households using grid electricity for lighting ranged from 76% in Yangon and 45% in Nay Pyi Taw, 39% in Mandalay, 34% in Kayah and Mon, and 30% in Shan North, to the lowest of 8% in Tanintharyi Region, 11% in Ayeyarwady, 14% in Rakhine and 16% in Chin (Figure 6.18, Table 6.11). The range in using electricity for cooking was from 54% of households in Yangon, 37% in Nay Pyi Taw, 21% in Mandalay, 17% in Mon, 11%-14% in Shan North, Shan South and Kayah, to the lowest at 1% of the households in Rakhine and Tanintharyi.

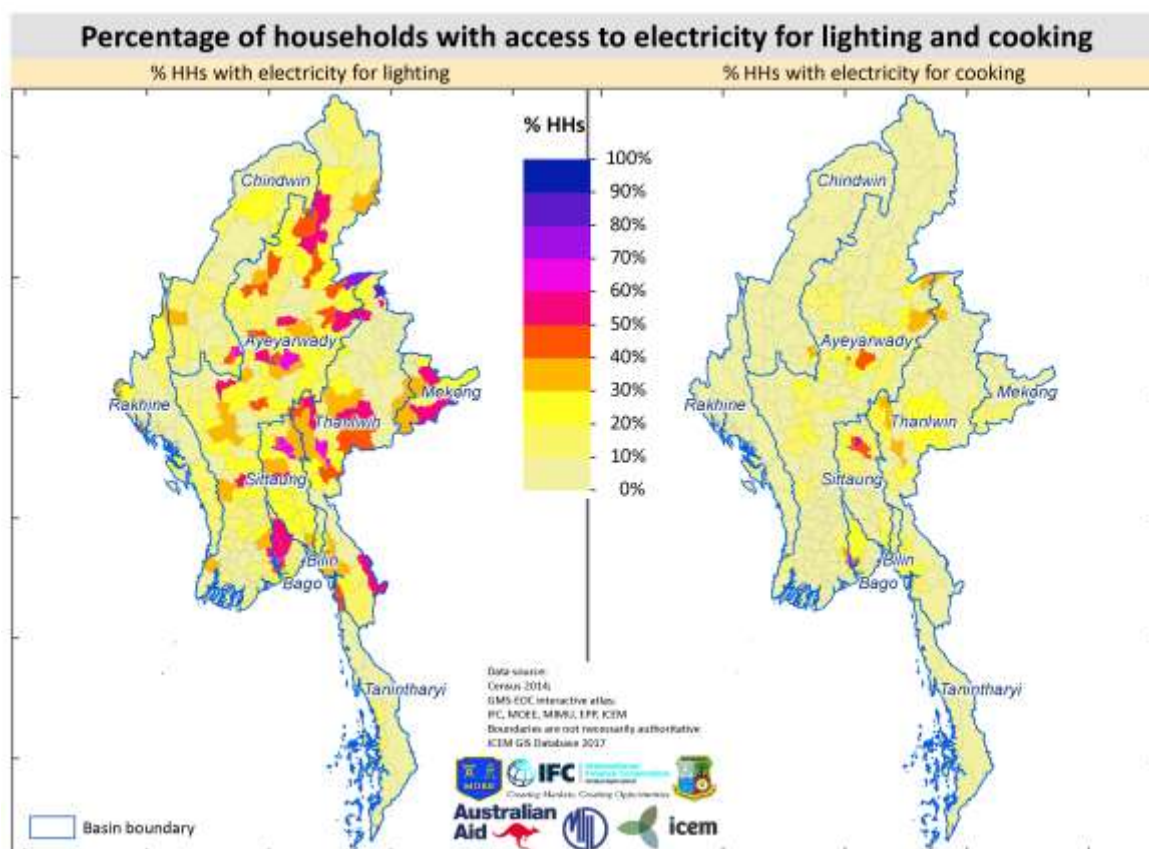
**Table 6.11: Mean % of households in Township with access to grid electricity for lighting and cooking by State/Region**

State/Region	Grid electricity for lighting	Grid electricity for cooking
	Mean % HHs in Townships	
Ayeyarwady	11.3%	3.3%
Bago (East)	25.4%	8.6%
Bago (West)	23.4%	6.7%
Chin	15.9%	0.8%
Kachin	23.5%	3.3%
Kayah	34.0%	12.8%
Kayin	23.4%	6.7%

<sup>44</sup> Ministry of Electric Power (MOEP) of Myanmar, Department of Rural Development (DRD) of the Ministry of Livestock, Fisheries and Rural Development, Myanmar, and the World Bank, 2015

State/Region	Grid electricity for lighting	Grid electricity for cooking
	Mean % HHs in Townships	
Magway	19.1%	7.6%
Mandalay	39.3%	21.1%
Mon	33.9%	17.4%
Naypyitaw	45.4%	37.3%
Rakhine	14.1%	1.1%
Sagaing	20.4%	6.1%
Shan (East)	28.5%	4.0%
Shan (North)	30.3%	11.3%
Shan (South)	27.8%	13.8%
Tanintharyi	7.6%	1.0%
Yangon	76.5%	54.4%
<b>All</b>	<b>31.3%</b>	<b>15.3%</b>

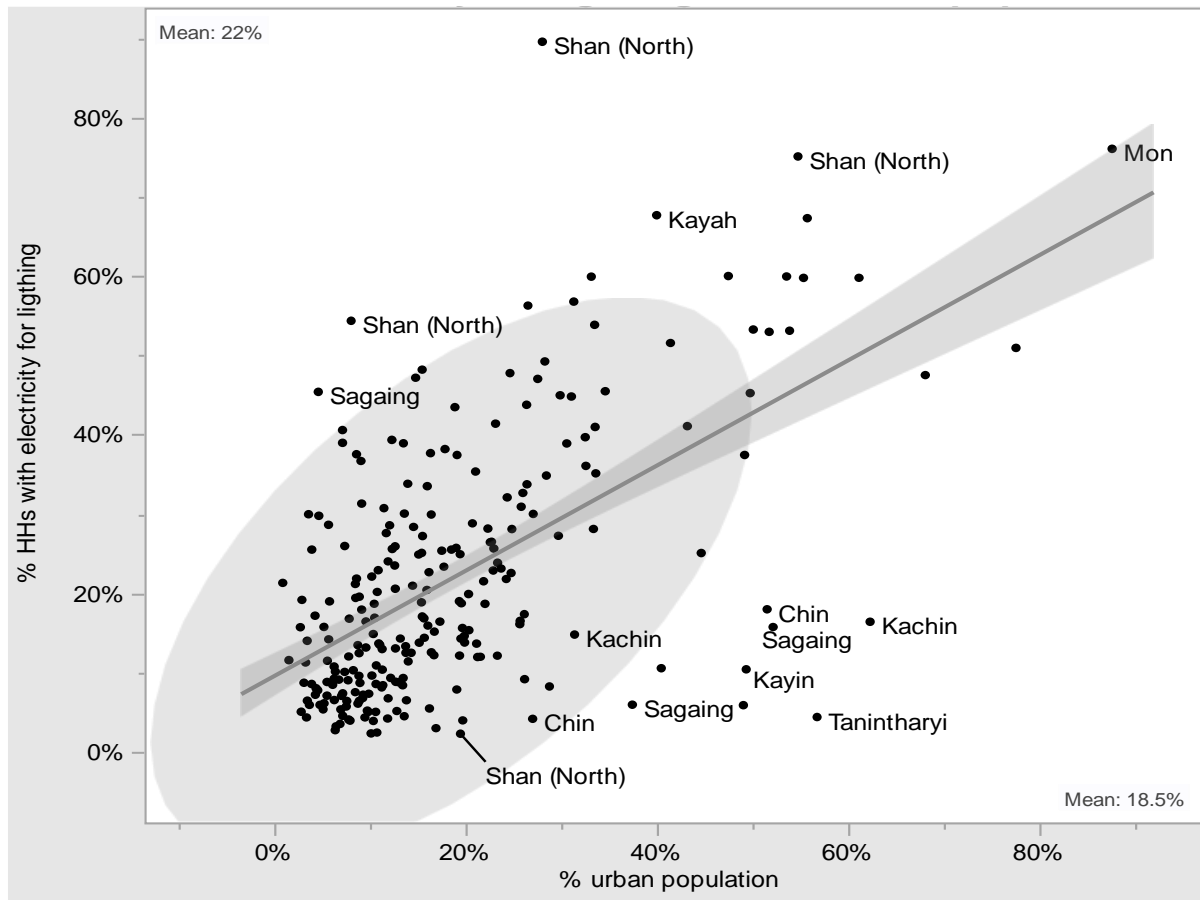
Figure 6.18: Access to electricity for lighting and cooking by Township



There is a strong relationship between the percentage of urban population in Townships and the percentage of households that have access to grid electricity. Electricity use for lighting is a valid indicator for electrification rate. Figure 6.19 shows the percentage of Township households with electricity by the percentage of Township urban population, excluding Yangon, Mandalay and Nay Pyi Taw. The shaded oval area covers 90% of Townships.

A number of outlier Townships (indicated by State/Region name in the graph) with high use rates and low urban population rates, or vice versa, have been marked with their State/Region name to illustrate the local variation between Townships within States and Regions in electrification rate.

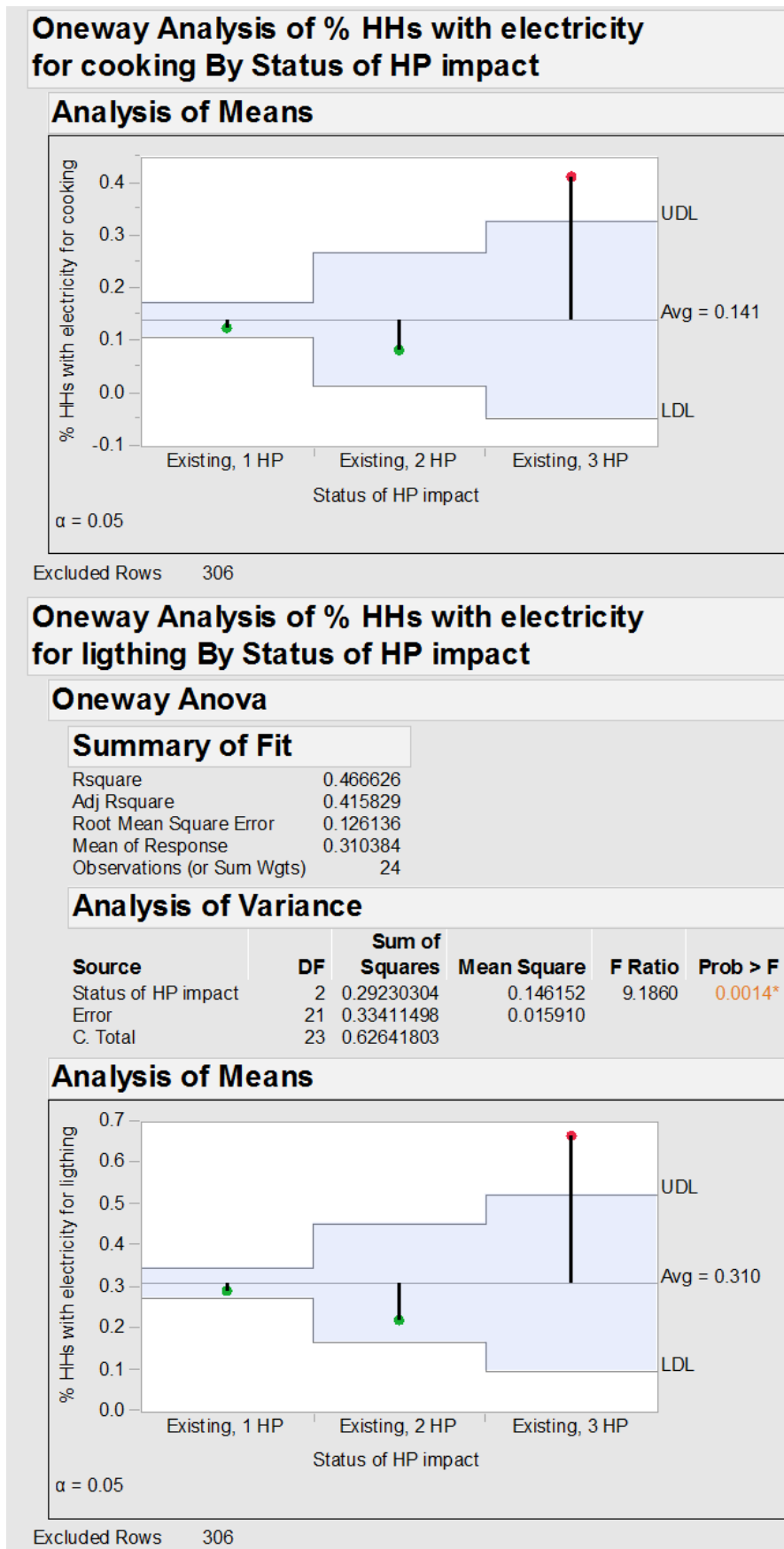
**Figure 6.19: Electrification rate by percentage of urban population by Township**



Data source: Census 2014

With regard to a possible relationship to the potential impact on the Township from existing or under construction hydropower, there is no statistically significant relationship with the proportion of households using grid electricity for lighting and cooking in Townships. However, if the number of existing hydropower plants that potentially impact Townships are considered, or in other words, the density of hydropower plants inside or close to a particular Township, it can be seen that in the two Townships that are potentially impacted by 3 hydropower plants - Loikaw in Kayah State and Pinyinmana in Nay Pyi Taw - there is a significantly higher percentage of households that use grid electricity for lighting and cooking compared to Townships that are potentially impacted by one or two plants (Figure 6.20) (The Analysis of Means chart shows an upper decision limit (UDL), a lower decision limit (LDL), and the middle line which is the overall mean. If a group's plotted statistic falls outside of the decision limits, then the test indicates that there is a statistical difference between that group's statistic and the overall average of the statistic for all the groups.)

Figure 6.20: Analysis of relationship between percentage of HHs in potentially impacted Townships from existing hydropower using grid electricity by number of hydropower plants potentially impacting



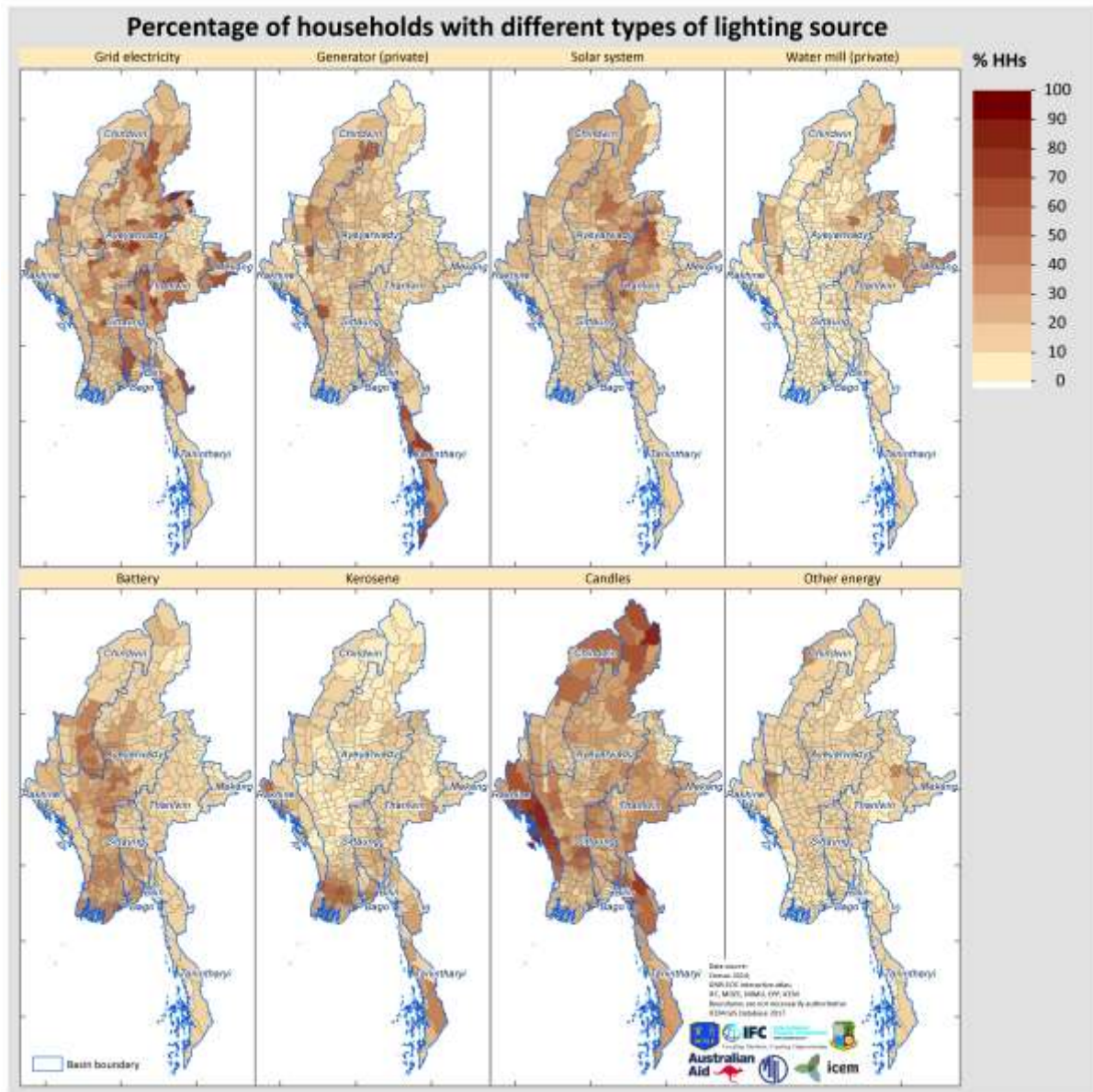
Given the low level of access to grid electricity, households in Myanmar use a number of other sources for lighting such as candles, generators, solar, water mills, batteries, and kerosene (Figure 6.21, Table 6.12). Candles are used extensively across the country, in Rakhine by as many as 56% of households in Townships in the state, and by 20 to 40% in Bago West (39%), Kachin (40%), Kayin (41.5%), Mon (33%), and Kayah (29%). Generators are mostly used in Tanintharyi (46% of Township households), and in Mon (22%). Solar systems are most common in Shan North and South at 30% and 28% respectively, and in Chin, Kachin and Kayah (16%-18%). It is likely that solar systems are more easily available in these States due to better access to imports from China.

**Table 6.12: Source of lighting by State/Region**

State/Region	Source of lighting							
	Grid electricity	Generator (private)	Solar system	Water mill (private)	Battery	Kerosene	Candles	Other energy
	Mean % HHs in Townships							
Ayeyarwady	11.3%	5.4%	4.7%	0.1%	30.8%	31.6%	15.6%	0.5%
Bago (East)	25.4%	6.3%	7.7%	0.1%	21.3%	14.8%	23.0%	1.2%
Bago (West)	23.4%	3.1%	6.0%	0.1%	23.5%	3.5%	39.1%	1.2%
Chin	15.9%	3.4%	15.9%	11.6%	9.2%	5.6%	27.3%	11.2%
Kachin	23.5%	6.8%	15.9%	7.1%	4.8%	0.3%	39.7%	2.0%
Kayah	34.0%	2.8%	17.7%	0.6%	5.3%	6.4%	28.7%	4.6%
Kayin	23.4%	10.5%	8.0%	1.3%	2.8%	12.0%	41.5%	0.5%
Magway	19.1%	15.9%	9.8%	1.8%	24.5%	0.7%	23.8%	4.5%
Mandalay	39.3%	11.2%	8.1%	0.8%	22.3%	0.4%	13.8%	4.1%
Mon	33.9%	21.7%	2.9%	0.4%	4.4%	3.6%	32.6%	0.5%
Naypyitaw	45.4%	11.2%	4.5%	0.2%	5.7%	0.6%	31.2%	1.3%
Rakhine	14.1%	8.7%	3.1%	0.2%	3.7%	13.7%	56.1%	0.3%
Sagaing	20.4%	16.1%	13.6%	1.0%	23.4%	1.1%	18.1%	6.2%
Shan (East)	28.5%	4.1%	7.9%	22.6%	1.2%	6.1%	22.2%	7.4%
Shan (North)	30.3%	2.0%	29.3%	10.7%	3.8%	4.9%	14.3%	4.6%
Shan (South)	27.8%	1.7%	30.3%	8.4%	4.0%	2.6%	23.7%	1.4%
Tanintharyi	7.6%	46.0%	2.8%	0.7%	0.8%	18.8%	22.4%	0.9%
Yangon	76.5%	3.0%	1.9%	0.0%	9.2%	5.0%	5.9%	0.4%
<b>All</b>	<b>31.3%</b>	<b>9.2%</b>	<b>11.1%</b>	<b>3.3%</b>	<b>13.7%</b>	<b>6.9%</b>	<b>22.7%</b>	<b>2.9%</b>



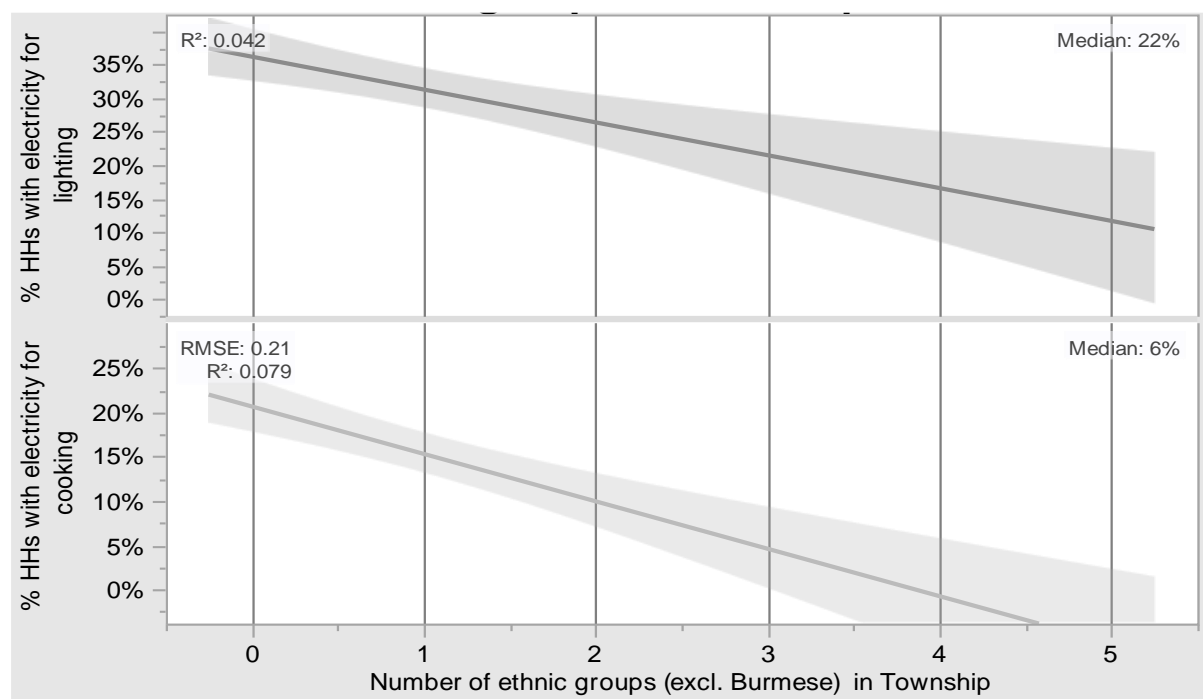
Figure 6.21: Source of lighting - % of households by Township



Private water mills are used in Shan East by 23% of the households, but otherwise this technology is only used at notable scale in Chin (12%), Shan North and South (11% and 8%) and in Kachin (7%). Batteries are most common in Ayeyarwady (used by an average of 31% of the households) and in Bago, Magway, Mandalay and Sagaing at 21%-25% of the households. Kerosene is used in Ayeyarwady by on average 32% of the households, and in Bago East, Kayin, Rakhine and Tanintharyi by 12% to 19%.

A regression analysis of the number of ethnic groups, excluding the Barma, in Townships and the average percentage of households using electricity for lighting and cooking reveals that there is a statistically significant relationship between these variables: the more ethnic groups there are represented in a Township the lower the percentage of households using, and by extension, have access to grid electricity (Figure 6.22).

**Figure 6.22: Access to grid electricity by number of ethnic groups in Townships**



Data source: Census 2014, GMS-EOC map of ethnic groups overlaid on Township boundaries.

**Trends and drivers:** General development, urbanization, rising incomes, and increased autonomy to ethnic states/regions will increase demand for domestic electricity. For rural electrification the penetration of solar systems, mainly in areas with better access to imports from China, indicates that availability of technology options and their timing and pricing is likely to influence the spread of different types of energy technology. The electricity grid will need to expand rapidly and provide reliable and cheap energy to be able to compete with increasing use of non-grid renewable technologies for rural domestic supply. Urbanization will increase demand for grid-based energy.

During 2015 to 2030, the national electrification program is expected to connect around 7.2 million homes of which more than 99 per cent will be through electricity grid extension. Very rarely (one percent of the time or less), mini-grid systems (in this case, village or town-scale systems) and off-grid systems (solar home systems) are promoted, typically for the smallest and most remote communities, predominantly in Chin, Kachin, Shan and other mountainous and border areas.

According to the Energy Master Plan 2015<sup>45</sup>, the total share of renewable energy such as mini-hydro, solar and biogas in village electrification made up only 18.9% of the total, while the main power source was local generation by mostly diesel engines.

## 6.8 Access to Information and Communications Technology (ICT)

ICT will have a big role in shaping the future in Myanmar. The SEA has selected it an indicator for changes in governance, education, inter-connectivity, and not least, awareness raising about environmental issues and solutions.

In 2014, at the time of Census, most areas of the country had no landline telephone connection, while 25% of the households had mobile telephones (Figure 6.23, Table 6.13). On average 37% of households in the Townships had a TV and 27% a radio. TVs were most widespread in Shan North and South, Mon, Kayin and Kayah states at an average of 45% of households. In most other States around 35% of the households had a TV. Owning a radio was most common in Rakhine (41% of households), Magway (41%), Ayeyarwady (38%) and Bago West (36%). Internet access at home and

<sup>45</sup> The Government of the Republic of the Union of Myanmar National Energy Management Committee, (2015). *Myanmar Energy Master Plan*.

ownership of computers was very low, even in Yangon at 10% and 6% of the households respectively.

**Table 6.13: Ownership to ITC assets - 2014**

State/Region name OK	Television		Radio		Mobile phone*		Land line phone	
	Nos HHs		Nos HHs		Nos HHs		Nos HHs	
	Sum	Row %	Sum	Row %	Sum	Row %	Sum	Row %
Ayeyarwady	588,361	36.6%	616,908	38.4%	285,832	17.8%	68,147	4.2%
Bago (East)	284,364	38.3%	216,431	29.2%	177,518	23.9%	26,832	3.6%
Bago (West)	233,822	38.1%	218,399	35.6%	122,016	19.9%	16,439	2.7%
Chin	24,884	37.3%	18,535	27.8%	15,567	23.3%	4,583	6.9%
Kachin	163,655	39.0%	116,051	27.7%	100,953	24.1%	17,147	4.1%
Kayah	31,246	44.4%	16,679	23.7%	16,045	22.8%	2,197	3.1%
Kayin	145,072	45.5%	69,687	21.8%	78,087	24.5%	11,476	3.6%
Magway	348,256	32.2%	440,704	40.7%	219,450	20.3%	32,145	3.0%
Mandalay	697,909	35.4%	523,858	26.5%	540,785	27.4%	59,648	3.0%
Mon	258,468	44.0%	137,713	23.4%	144,514	24.6%	19,399	3.3%
Naypyitaw	132,458	33.3%	100,374	25.2%	118,295	29.7%	10,069	2.5%
Rakhine	101,646	29.4%	142,217	41.2%	72,837	21.1%	12,886	3.7%
Sagaing	462,064	36.6%	469,946	37.3%	238,163	18.9%	44,285	3.5%
Shan (East)	97,066	41.7%	36,309	15.6%	75,707	32.5%	9,649	4.1%
Shan (North)	261,384	44.6%	94,645	16.2%	172,126	29.4%	28,862	4.9%
Shan (South)	280,377	44.4%	141,543	22.4%	154,825	24.5%	18,544	2.9%
Tanintharyi	139,095	39.2%	95,453	26.9%	84,452	23.8%	12,122	3.4%
Yangon	1,132,863	36.4%	410,729	13.2%	964,579	31.0%	130,083	4.2%
<b>All</b>	<b>5,382,990</b>	<b>37.4%</b>	<b>3,866,181</b>	<b>26.8%</b>	<b>3,581,751</b>	<b>24.9%</b>	<b>524,513</b>	<b>3.6%</b>

Source: Data from Census 2014, own analysis, \* mobile phone coverage is changing rapidly so data must be considered to be out dated.

**Trend:** Since the Census was conducted there has been massive growth in mobile phone adoption, and also in Internet penetration and social media usage. A 2015 survey found that 58% of households had an active mobile SIM and 57% a mobile handset. This is more than double the percentages found in the Census 2014. Furthermore, smartphones are the first handsets owned by 80% of mobile users in the country. A report from 2015 by Ericsson suggested that 6% of the world's new mobile subscribers are from Myanmar, making it the fourth fastest-growing mobile market on earth. The consumer market in Myanmar has moved straight to digital and mobile (Zainudeen and Galpaya, 2015).<sup>46</sup>

With regard to gender aspects of ICT, women are 29% less likely to own a mobile phone than men due to a combination of low household income and traditional gender roles; men and women who leave the house for work or studies get priority for mobile ownership.

<sup>46</sup> Myanmar's mobile revolution. (2016). [online] Mizzima. Available at: <http://www.mizzima.com/business-domestic/myanmar%E2%80%99s-mobile-revolution#sthash.yrBNXR3X.dpuf>.





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