



# 2017

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## DEQING'S PROGRESS REPORT ON IMPLEMENTING THE 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT

---

A COMPREHENSIVE MEASUREMENT WITH STATISTICAL  
AND GEOSPATIAL INFORMATION



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# Preface

On 25 September 2015, the United Nations Sustainable Development Summit adopted the 2030 Agenda for Sustainable Development (the "2030 Agenda") with 17 Sustainable Development Goals (SDGs) and 169 targets for all nations, aiming to end poverty, promote prosperity and people's well-being while protecting the environment by 2030. The agenda represents a new coherent way of embracing economic growth, social inclusion, and environmental protection as an 'indivisible whole'. The United Nation further proposed and promoted a systematic follow-up and review of implementation of this global agenda, including indicator-based and data-driven measurement and reporting of the progress towards SDGs at national, regional and global levels.

China has always put sustainable development as one of its top priorities and President Xi Jinping signed the "2030 Agenda" while attending the United Nations Sustainable Development Summit. Premier Li Keqiang hosted a symposium on "Sustainable Development Goals: Working Together to Transform Our World - China Proposition" at the United Nations Headquarters in New York in September 2016, and announced the release of "China's National Plan on Implementation of the 2030 Agenda for Sustainable Developmen" (abbreviation "National Plan"). Specific targets and roadmaps for implementing 17 SDGs and 169 targets in China were identified by combining the 2030 Agenda with national medium and long-term development plan as well as integrating the implementation of the international agenda and the domestic strategic process.

"Measuring and Monitoring SDGs" is one of the major six themes of the United Nations World Geospatial Information Congress (UN WGIC), which will be held in Deqing County, Zhejiang Province, China, from November 19 to 21, 2018. In order to track Deqing's progress towards SDGs, a team of 30 researchers, led by the National Geomatics Center for China (NGCC), together with several universities and high-tech enterprises, measured 102 SDG indicators over the 938-square-kilometre county in line with United Nations global SDGs indicator framework. Multi-scale and multi-type geospatial and statistical data were integrated for comprehensive measurement and evidence-based progress analysis. These data included topographic and land-cover maps, aerial and satellite images, disaggregated socio-economic information and environment statistics, as well as some from social media. A number of methodological or technical issues have been tackled, such as the applicability and localization of United Nations global SDG indicator framework, geospatial disaggregation of socio-economic data, geo-computation of certain SDG indicators, etc.

This report presents the methodology and assessment results of this pilot project. The major conclusions are (1) the comprehensive progress towards SDGs in an entire administrative region can best be measured and assessed by integrating geospatial and statistical information; (2) Deqing county, which has a population of around 430,000, has made significant economic and social advances while maintaining a good ecological environment over the past few years. Challenges such as inadequate public transport in some regions have been drawn to the attention of policymakers. An online SDGs Knowledge portal charts Deqing's progress towards achieving the SDGs and can be found from (<http://47.99.207.114/deqing/>, or [www.deqing-sdgs.net](http://www.deqing-sdgs.net)). The results will be presented at the coming UN WGIC as a good practice and a live example to stimulate discussions and further actions on better supporting SDGs with geospatial information.

# Directory

<b>1. Introduction</b>	01
1.1 Geographical location	01
1.2 Comprehensive measurement of progress towards SDGs	03
<b>2. Goal Assessment</b>	08
Goal 1. End poverty in all its forms everywhere	08
Goal 2. End hunger, achieve food security and improve nutrition and promote sustainable agriculture	11
Goal 3. Ensure healthy lives and promote well-being for all at all ages	14
Goal 4. Ensure an inclusive and equitable quality education and promote lifelong learning opportunities for all	17
Goal 5. Achieve gender equality and empower all women and girls	20
Goal 6. Ensure availability and sustainable management of water and sanitation for all	23
Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all	26
Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	29
Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	32
Goal 10. Reduce inequality within and among countries	36
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable	39
Goal 12. Ensure sustainable consumption and production patterns	42
Goal 13. Take urgent action to combat climate change and its impacts	45
Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	48
Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	52

Goal 17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development .....	55
Single goal assessment summary .....	58
<b>3. SDGs Cluster Analysis.....</b>	<b>59</b>
3.1 Economic Growth.....	59
3.2 Natural Beauty.....	63
3.3 Social harmony.....	69
3.4 Summary .....	73
<b>4. Conclusion.....</b>	<b>74</b>
4.1 A data driven and evidence–based approach for comprehensive assessment.....	74
4.2 Deqing's progress towards 2030 SDGs .....	75
4.3 Outlook .....	76
<b>Acknowledgements.....</b>	<b>78</b>

# 1. Introduction

## 1.1 Geographical location

Deqing, meaning "a man's virtue (DE) is as clear (QING) as water", is a county affiliated to Huzhou municipality, Zhejiang Province, China, with an area of 937.92 square kilometers and a household registration population of 430,000. As an in-land county, Deqing belongs to the Yangtze River Delta and the subtropical humid monsoon climate makes it four clear seasons with warm and humid weather, and annual average temperature of 17.2°C. Its topography is higher in the west and lower in the east, and land cover can be characterized as "50% mountain, 10% water and 40% farmland", forming a livable place with mountains in view and waters in sight. In addition, Deqing is located adjacent to the north of Hangzhou and to the west of Shanghai, which makes Deqing as an important node in the proximity of Shanghai and Hangzhou. It will take only 13 minutes to Hangzhou from Deqing by high-speed train, and less than 2 hours to core cities in the Yangtze River Delta region (such as Shanghai, Ningbo and Nanjing) by car. Moreover, Deqing has the following three major characteristics.



Fig.1-1 Geographical Location of Deqing

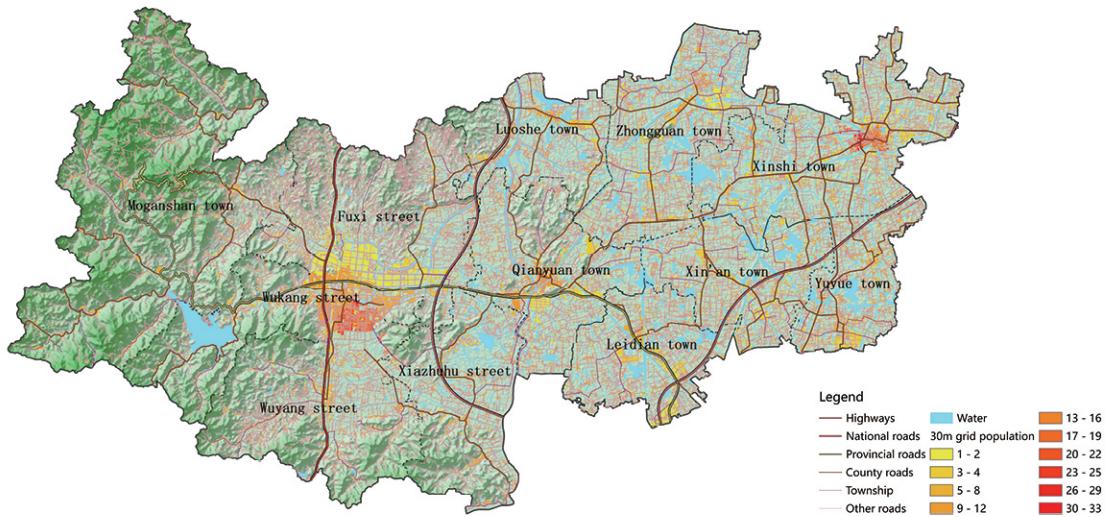


Fig. 1-2 Spatial Distribution of Population in Deqing

### (1) An open and inclusive "city of entrepreneurship and innovation"

In 2017, the GDP of Deqing achieved 47.02 billion yuan (6.91 billion US dollars) with an annual growth rate of 8.5%, ranking 36th in the top 100 counties of China. Three leading industries (including

equipment manufacturing, biomedicine and green household) have formed a certain scale, and strategic emerging industries (like geographic information, general aviation and artificial intelligence) have flourished. Deqing has built a geographic information town to lead the agglomeration of the geographic information industries, and launched a project to develop artificial intelligence applications with intelligent eco-city as the core. The comprehensive evaluation of agricultural modernization was ranked as the top one for last four consecutive years in Zhejiang province with the rapid growth of modern service industries, such as leisure tourism, airlines logistics, finance and cultural creativity industries.



Fig. 1–3 Geographic Information Town

### (2) A "land of harmonious livelihood" integrated with its deep-rooted culture

With a history of more than five thousand years of civilization, Deqing has long been a prosperous place which keeps simple folkway and attracts talents. In addition, it is one of the birthplaces of Chinese original porcelain and silk crafts, as well as ancient court dance. In recent years, Deqing has vigorously promoted the equal quality of public services in urban and rural areas, and become one of the best places to demonstrate urban-rural integrated development in Zhejiang province and in the country. Deqing has formed a good public safety and social security institutions by combining "law-rule, virtue-rule and self-rule", and has been awarded the "the most safe County" in Zhejiang Province for last 13 consecutive years.

### (3) A "large ecological garden" with water and mountains in sight

Moganshan, located in the west of Deqing, is one of the four major summer resorts in China. It is also a gathering place for international celebrities and merchants. The Xiaozhu Lake, located in the

central part of the county, is the largest original ecological wetland in the regions south of the Yangtze River. Xinshi, located in the east of the county, is an ancient town with a history of one thousand years. In recent years, efforts have been devoted to the synchronization of beautiful cities, beautiful towns and beautiful villages on its ecological heritages. One of its best practices is the creation of the s "Hill Station"(home-stay hotel), the first original ecological brand in the country. Moreover, Moganshan was listed by The New York Times as 45 most worthwhile places in the world. Deqing was also awarded as national ecological county and national model county for leisure agriculture and rural tourism.



Fig. 1-4 Moral Hall in Deqing



Fig. 1-5 Tea Garden in Deqing

## 1.2 Comprehensive measurement of progress towards SDGs

In order to track the overall progress towards SDGs, a data-driven and evidence-based approach was developed. The key elements of this approach include the localization of United Nations global SDG indicator framework, data-driven measurement of indicators, indicator and evidence-based single SDG and SDGs cluster analysis.

### (1) Localization of UN Global SDGs indicator framework

In March 2016, the United Nations Statistical Commission (UNSC) adopted the global SDG indicator framework with a set of 244 indicators for monitoring progress on the 17 SDGs and 169 targets. The global indicator framework has a wide-ranging scope and was suitable basically for national SDGs monitoring. A localization process has to be undertaken when applying the framework at a sub-national or regional level (such as the Deqing County case). The indicators are selected to align with sub-national (or regional) development priorities and geographical circumstances. While some indicators can be selected or adopted directly from the global framework, some others might be revised, extended or substituted. In addition, the selected indicators should have a good coverage of major SDGs and its targets for assuring a comprehensive progress measurement. Moreover, data availability and reliability is another important factor in consideration.

After a careful analysis of the 17 SDGs and local sustainable development practices, a set of 102 indicators was selected for Deqing County. Among them, 47 indicators were adopted directly from the global indicator framework (labeled as A), 6 indicators were the results of the extension (labeled as E), 42 indicators were revised (labeled as R) and 7 indicators were substituted (labeled as S). Meta-data are also developed for each of the 102 indicators, including their definition, calculation method, and data used.

## (2) Data driven– measurement of indicators

More than 200 types of statistical and geospatial data were used in this case study. The statistical data come mainly from authoritative information sources, such as County Annual Statistical Bulletin, County Government Work Report and the Water Resources Bulletin. Some others are provided by the relevant government departments or agencies. Geospatial data are provided mainly by Deqing Geographic Information Centre. Time series remote sensing data over last 30 years have been collected. In order to facilitate the integrated analysis of statistical and geographic data, population data were disaggregated at 30-m spatial resolution with the help of geospatial data.

The 102 indicators were derived or measured in three different ways. The first is the direct calculation with statistical data, using ratio (or proportion), rate of change, index or other calculations. The second is the direct derivation from geospatial data, using spatial density calculation, coverage classification and others. The third is the integrated utilization of statistical and geospatial information on the basis of quantitative measurement of spatial accessibility, coverage, spatial relations, etc.

The quantified indicators are further assessed by comparison with "SDGs Index and Dashboard", National plan and other possible references:

- ◆ **The SDGs Index and Dashboard.** Released in 2017 by the Bertelsmann Foundation and the United Nations Sustainable Development Solutions Network (SDSN), it was derived from the results of 157 UN member states/regions by adjusting the indicators to the score range between 0 (lowest) and 100 (highest). The scores are divided into four segments, i.e., the top quarter (green, basically fulfilling the requirements of the indicator), the second quarter (yellow, to be upgraded), the third quarter (orange, challenging), and the bottom quarter (red, far from achieving the 2030 indicator requirements). It is marked as category " I " in the following part of the report.

- ◆ **National Plan.** It defines a set of quantitative requirements to be achieved until 2020 and 2030 respectively for different SDG indicators. This quantitative reference is marked as category " II " in the following part of the report.

- ◆ **World-level comprehensive assessment.** The world's advanced level and average level of a given indicator is also used for comparison and assessment. It is marked as category " III " in the following part of the report.

- ◆ **Multi-assessment.** If there is no reference standard above, an appropriate evaluation might be given by a comparison with national average and position in the world. This report marks it as a quantitative reference for the " IV " category.
- ◆ **Others.** For indicators without the above comparison references, the evaluation criteria in the UN SDG metadata can be used, or the relevant criteria in international authoritative academic papers can be used to give appropriate evaluation results. This report marks it as a quantitative reference for the " V " category.
- ◆ **Not comparable.** "Gray" is used for making those indicators that are not comparable.

### (3) Indicator-based single goal assessment

As one SDG may have many targets, it is necessary to group these targets into 2 to 3 sub-sets for a focused and meaningful analysis according to the local circumstance of the study area. Each of the sub-sets will have a clearly implied meaning (or connotation) and will subject to a focused quantitative evaluation (or assessment) and quantitative analysis.

- ◆ Quantitative evaluation with quantified indicators: Based on the results of quantitative evaluation of indicators, a single goal is rated according to the principle of "minimum factor", and the degree of realization of each goal is determined by the degree of realization of the lowest indicator in the goal.
- ◆ Qualitative analysis: The baseline status, progress, major characteristics and the successful practice in implementing this goal will be analyzed. In addition, existing problems or challenges facing need to be identified.

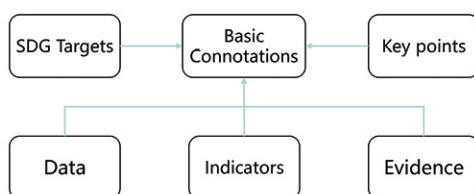


Fig. 1-6 Single SDG Assessment Based on Quantitative Results and Facts

### (4) Evidence-based SDG cluster analysis

An overall picture of how far the region being from achieving the SDGs can be derived and displayed with further SDG cluster analysis. All the major SDGs are grouped into three different SDG clusters (i.e. environmental cluster, economic cluster and social cluster) according to the contribution or relevance of their indicators. It should be noted that two SDGs are not grouped into the three SDG clusters. SDG 14 does not take effect in inland Deqing, and SDG 17 is about the coordination. Therefore, the economic cluster has five SDGs, i.e., SDG 2, 7, 8, 9 and 10. Environmental cluster has 5 SDG, i.e., SDG 6, 7, 12, 13 and 15. Social cluster has 11 SDGs, i.e., SDG 1, 2, 3, 4, 5, 6, 7, 8, 10, 11 and 16. It can

be seen that some single goal has been allocated to 2 or 3 goal clusters. For instances, both SDG 2, SDG8 and SDG 10 are grouped into economic and social clusters, and SDG 6 belongs to both social and environmental clusters. SDG 7 falls into all the three clusters due to the contribution of their individual targets or related indicators.

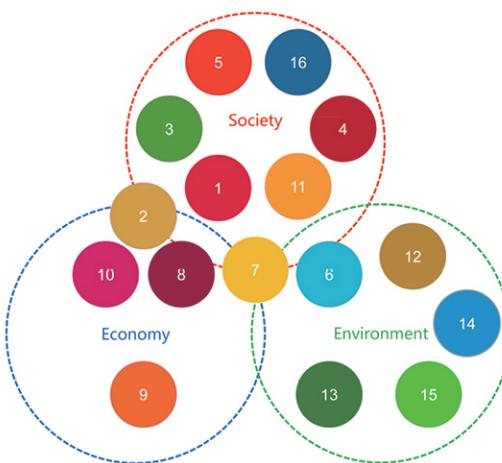


Fig. 1–7 SDGs Clusters of Economic Social Environmental Objectives

A set of key elements or analysis priorities are further defined for each SDGs cluster. For instance, the economic SDGs cluster will focus on the analysis of economic growth conditions, economic growth trend and the economic development. The environmental SDGs cluster focuses on the analysis of resource use, ecological environmental protection and regional responses to climate change, while the social SDGs cluster aims to analyze how the three basic needs (survival, security and development) are met.

According to the indicator rating and the results of the single SDG assessment, the degree of coordination of each SDG cluster will be calculated through the mean, standard deviation and coefficient of variation. They are used to evaluate the development coordination degree of every indicator within each SDG cluster and among the three clusters. The overall development level, characteristics and best practices are further elaborated on the basis of the analysis results of single SDG and SDG clusters. The final results are used for telling stories about how Deqing has implemented its SDGs and what are their challenges and future directions.

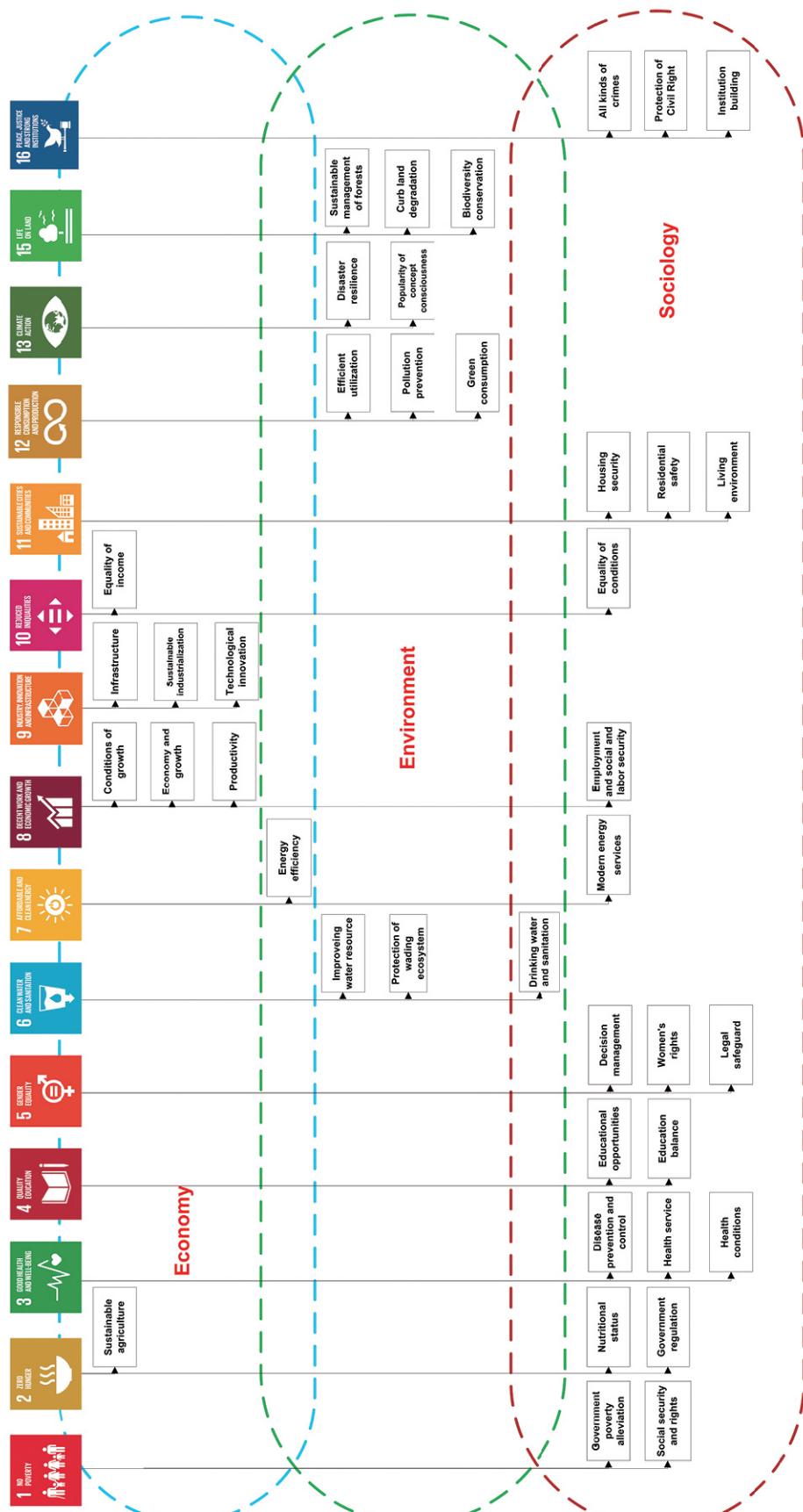


Fig. 1-8 Connotation Analysis of SDGs Clusters

## 2. Goal Assessment

**1 NO POVERTY**



**[ Goal 1 ]**

**End poverty in all its forms everywhere**

### Connotation and Indicators

SDG 1 aims to help all people to increase their income and to eliminate poverty through social security. The goal is achieved by way of government poverty alleviation, and social security and rights.

- ◆ "Government goal on poverty alleviation" emphasizes poverty eradication, including living expenses, consumption expenditure, disposable income, government expenditure on basic services, government aid expenditure, etc. Indicators 1.1.1, 1.a.2 and 1.b.1 are used for quantitative assessment.
- ◆ "Social security and rights" emphasizes fairness to enjoy basic services and social security benefits, including social security coverage, minimum living security, safe drinking water services, road accessibility, nine-year compulsory education, basic medical services and basic cultural life services. The indicators used are 1.3.1 and 1.4.1.

### Quantification

SDG 1 includes 5 indicators. Indicator 1.4.1 is measured by combining statistical and geospatial data, and the remaining 4 indicators are calculated with statistical data.

Table 2-1 Quantified indicators for SDG 1

Content	Indicators	Quantitative result	Evaluation reference
Poverty Eradication	1.1.1 Basic standard of living		
	1.1.1.a Minimum living expenses per person per day	20.5 CNY/day	≤ \$1.90/day III
	1.1.1.b Engel's Coefficient	R Urban: 28.2% Rural: 25.5%	30.1% IV
	1.1.1.c Per capita disposable income	Urban: 46444 CNY Rural: 27140 CNY	Urban: 33616 CNY Rural: 12363 CNY IV
	1.a.2 Proportion of total government spending on basic services (education, health, and social security)	A 39.34%	33.5% IV
	1.b.1 Proportion of government recurrent and capital expenditure used for the benefit of women, the poor and the disadvantaged groups in particular	A 2.44%	Increase year by year
	1.3.1 Proportion of population covered by the social security system		
	1.3.1. a Proportion of population with at least one social cash welfare insurance	≥96.41%	45% III

Content	Indicators	Quantitative result	Evaluation reference
Fairness to Enjoy Basic Services & Social Security Benefits	1.3.1.b Proportion of households with subsistence allowances	1.42%	
	1.3.1.c Proportion of people with disabilities in financial difficulty entitled to receive cost-of-living allowances	R 100%	
	1.4.1 Population and proportions of access to basic services		
	1.4.1.a Proportion of population using safely managed drinking water services	Rural: 99.6% Urban: 100%	Green: ≥98% Yellow: 98%>x≥89% Orange: 89%>x≥80% Red: <80%
	1.4.1.b Proportion of the rural population who live within 2 km of an all-season road	100%	III
	1.4.1.c Consolidation rate of primary / junior high school	E 100%	II
	1.4.1.d Coverage of basic health services	100% of the residents can reach the village clinic in 15 mins, the town health center in 30 mins and the county general hospital in 55 mins.	III
	1.4.1.e Coverage of basic cultural life services	100% of the residents can reach cultural facilities in 40 mins.	III

Notes: ① The data in the table is 2016 data, except for \* represents 2015 data, \*\*represents 2017 data.

② A—adopted, R—revised, S—substituted, E—extended.

③ I—SDG Index and Dashboards, II—National Plan, III—World-level comprehensive assessment, IV—Multi-assessment, V—Others.

## Implementation

**After eliminating extreme poverty, government spending on basic services has increased over the year by year and efforts to support vulnerable groups, such as women, the disabled, and the poor, have continued to increase.** The government's funds increased by 86.2% in 2016 compared with 2012, which accounts for 2.44% of the Government's fiscal expenditure. The minimum daily living cost per person for low-income people is 20.5 yuan (3.15\$/day), which is much higher than the international poverty line (1.9\$/day) and that of China 8.1 yuan/day (1.25 \$/day). The urban-rural income ratio is reduced from 1.89 in 2012 to 2016 in 1.71, and the well-being of all people is shared.



Fig. 2-1 Volunteers Care For the Elderly

**A sound social security system was established to ensure that everyone enjoys one or more Cash Benefits Social Security Plan.** Deqing established a comprehensive social security system which connected employment, social insurance, social assistance. Travel, education, medical care, cultural life and other basic public services has achieved 100% coverage. Primary endowment insurance, basic medical insurance, industrial injury insurance, unemployment insurance, maternity insurance have realized urban-rural integration. In 2016, the basic medical insurance covered 96.41% of the population. Government and enterprises offer caring job positions to help 86.2% of the disabled with working ability. As a result, the participation rate of disabled people reached 50.13%. Deqing's umbrella social security system has been gradually completed, and basic public services have been fully covered.

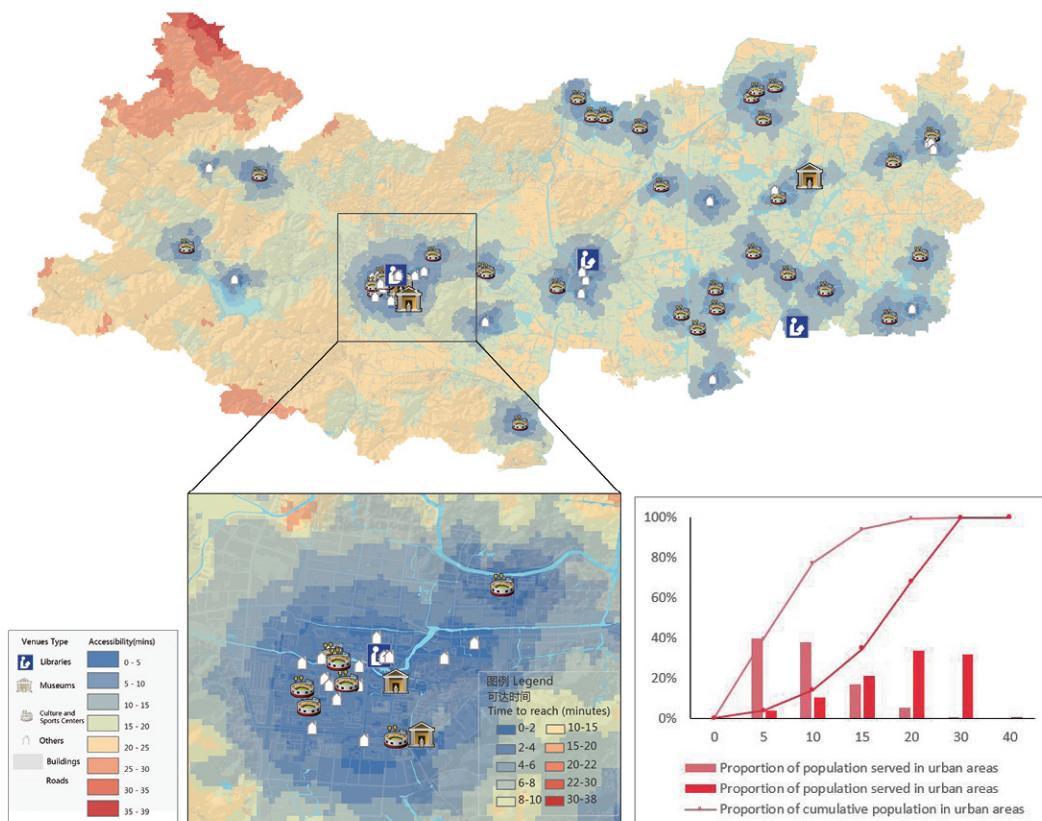


Fig. 2-2 Basic Cultural Services in Deqing

## Summary

Deqing has taken the lead in improving its caring assistance, increasing basic service expenditures, establishing an all-round social security system, and eliminating extreme poverty. The goal of "eliminating all forms of poverty" has been achieved ahead of schedule.



## [ Goal 2 ]

### End hunger, achieve food security and improve nutrition and promote sustainable agriculture

#### Connotation and Indicators

Sustained access to nutritious and healthy food is a fundamental requirement for achieving sustainable development. SDG 2 includes three specific objectives, nutritional status, sustainable agriculture, and government regulation.

- ◆ "Nutritional status" focuses on food security, including food consumption, food supply, agricultural safety, child nutrition and health. The indicators used are 2.1.1, 2.1.2, 2.2.1 and 2.2.2.
- ◆ "Sustainable agriculture" emphasizes the sustainable food production, including grain yield, farmers' income, and sustainable agricultural area. The related indicators are 2.3.1, 2.3.2 and 2.4.1.
- ◆ "Government regulation" focuses on government investment and commodity price, including agriculture orientation index and food price. Indicators 2.a.1 and 2.c.1 are used.

#### Quantification

SDG 2 includes 9 indicators. Indicator 2.4.1 is quantified in combination with statistical data and geospatial data, and the remaining indicators are quantified by statistical data.

Table 2–2 Quantified indicators for SDG 2

Content	Indicators	Quantitative result	Evaluation reference
Food Security	2.1.1 Engel's Coefficient	S Urban: 28.2% Rural: 25.5%	30.1% <span style="background-color: green; color: white; padding: 2px;">IV</span>
	2.1.2 Food security		
	2.1.2.a Self-sufficiency rate of grain	R 56.3%	102.9% <span style="background-color: grey; color: white; padding: 2px;">IV</span>
	2.1.2.b Qualification ratio of agricultural products	98%	96% <span style="background-color: grey; color: white; padding: 2px;">IV</span>
	2.2.1 Prevalence of stunting among children under 5 years of age	A 0.22%	Green: ≤7.5 Yellow: 7.5 < x ≤ 11.25 Orange: 11.25 < x ≤ 15 Red: > 15% <span style="background-color: green; color: white; padding: 2px;">I</span>
	2.2.2 Prevalence of malnutrition among children under 5 years of age	A Wasting: 0.18%  Overweight: 1.82%	Green: ≤5% Yellow: 5 < x ≤ 7.5 Orange: 7.52 < x ≤ 10 Red: > 10% <span style="background-color: green; color: white; padding: 2px;">I</span>
Sustainable Food Production	2.3.1 Crop Yield	R 7.09 ton/ha	Green: ≥2.5 Yellow: 2.5 > x ≥ 2 Orange: 2 > x ≥ 1.5 Red: < 1.5 <span style="background-color: green; color: white; padding: 2px;">I</span>

Content	Indicators		Quantitative result	Evaluation reference
Sustainable Food Production	2.3.2 Per capita disposable income of rural residents	S	27140 CNY	12363 CNY
	2.4.1 Proportion of agricultural area under productive and sustainable agriculture	A	82.1%**	
Government Investment & Commodity Price	2.a.1 The agriculture orientation index for government expenditures	A	1.26	0.21*
	2.c.1 Indicator of food price anomalies	A	Price Watch 0-5times Price Alert 0-2times	

Note: The agriculture orientation index reflects the degree of government bias towards agriculture, greater than 1 indicating a high degree of government bias towards agriculture.

## Implementation

**Strengthen the food security responsibility system, steadily improve the qualified rate of agricultural products, and effectively protect food safety.** By delineating permanent basic farmland control lines and ecological control lines, the basic agricultural planting area and the supply of green and high-quality agricultural products are guaranteed. Through the promotion of the construction of honest agricultural products, the quality of products has been significantly improved. In recent years, agricultural products sampling pass rate has been maintained over 98%. Childhood stunting and malnutrition has remained much lower than the world and China average level. In the future, Deqing would make extensive use of geographic information, big data, and artificial intelligence to improve the quality of agricultural products, build well-known agricultural product brands, and support agricultural production and efficiency.



Fig. 2-3 Rice-turtle Symbiotic Ecological Model in Deqing

**Develop ecological agriculture, establish sustainable agricultural system, and steadily increase farmers' income.** Deqing introduced and promoted the high grain yield technology and relied on geographic information technology to carry out green high-yield and high-efficient demonstration base. In 2016, grain yields reached 7.09 tons/ha, which surpassed the world and China averages. Deqing implemented rice-fish (turtle) symbiosis and other ecological breeding models. The area of sustainable agriculture accounted for 82.1%, and reached 4333 ha (65,000 mu). Deqing set up the rural transaction system of comprehensive property right. The per capita disposable income of rural residents increased by an average of 10.3% per year in 2012-2016.

In the future, Deqing will continue to improve the agro-ecological environment, develop intelligent agriculture, and create a new model of green and efficient agriculture.

**Increase agricultural investments, maintain agricultural products production and marketing environment, and stabilize prices.** Deqing set up a farmer cooperation fund, optimized the agricultural supply structure, adjusted the cultivation area of agricultural products and develop grain industry and green ecological agriculture. In 2016, the agriculture orientation index for government expenditures reached 1.26, which was higher than the world average of 0.21. The prices of major agricultural products have remained stable in recent years, the number of abnormal food prices was between 0-2 times in 2016.

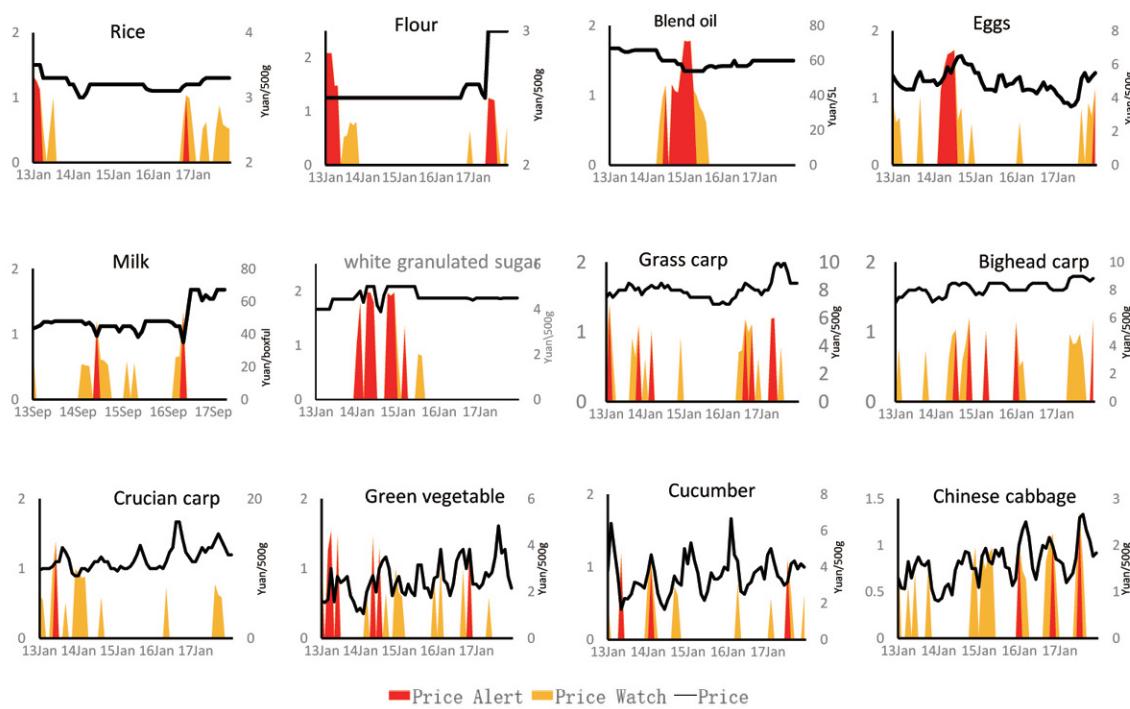


Fig. 2-4 Abnormal Value of Major Agricultural Products in Deqing

Note: The picture above shows the price fluctuation of various kinds of food in Deqing in recent five years. The difference between this month's price and historical price trends is greater than a standard deviation marked as abnormal price warning (red). The difference between the half standard deviation and a standard deviation is marked by abnormal price observation (yellow).

## Summary

Deqing increased agricultural inputs, strengthened the responsibility system for food security, and implemented food safety guarantee. Not only achieved zero hunger, but also promoted the healthy development of sustainable agriculture by developing ecological agriculture and promoting agricultural supply-side reform.



### [ Goal 3 ]

## Ensure healthy lives and promote well-being for all at all ages

### Connotation and Indicators

SDG 3 aims to eliminate infectious disease and reduce non-infectious diseases, call for improving women's reproductive health and maternal and child health, preserve and promote the health and well-being of all the people. It covers three specific objectives, health levels, disease prevention and control, and health services.

- ◆ "Health level" focuses on all types of mortality, including maternal mortality, child mortality, neonatal mortality, cardiovascular disease, cancer, diabetes or chronic respiratory disease mortality, traffic accident mortality, etc. Indicator used are 3.1.1, 3.2.1, 3.2.2, 3.4.1 and 3.6.1.
- ◆ "Disease prevention and control" focuses on the incidence of infectious diseases, including the number of new HIV infections, the incidence of tuberculosis, malaria and hepatitis B, vaccination rate. Indicator used are 3.3.1, 3.3.2, 3.3.3, 3.3.4 and 3.b.1.
- ◆ "Health service" focuses on medical services, including inpatient delivery rates, women's contraceptive rates, health expenditure, number of health workers, etc. Indicators used are 3.1.2, 3.7.1, 3.8.1, 3.b.2 and 3.c.1.

### Quantification

SDG 3 has 15 indicators. Indicator 3.8.1 is calculated with statistical data and geospatial data, the other 14 indicators are calculated with statistical data.

Table 2-3 Quantified indicators for SDG 3

Content	Indicators	Quantitative result	Evaluation reference	
Mortality	3.1.1 Maternal mortality ratio	A 0**	Green: $\leq 70$ Orange: $105 < x \leq 140$ Yellow: $70 < x \leq 105$ Red: $> 140$	I
	3.2.1 Under-five mortality rate	A 2.89‰**	Green: $\leq 25$ Orange: $37.5 < x \leq 50$ Yellow: $25 < x \leq 37.5$ Red: $> 50$	I
	3.2.2 Neonatal mortality rate	A 0.89‰**	Green: $\leq 12$ Orange: $15 < x \leq 18$ Yellow: $12 < x \leq 15$ Red: $> 18$	I
	3.4.1 Mortality probability attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease	A 8.93%**	Green: $\leq 15$ Orange: $20 < x \leq 25$ Yellow: $15 < x \leq 20$ Red: $> 25$	I

Content	Indicators	Quantitative result	Evaluation reference	
Mortality	3.6.1 Death rate due to road traffic injuries	A 6.98/100000**	Green: $\leq 8.4$ Orange: $12.6 < x \leq 16.8$ Yellow: $8.4 < x \leq 12.6$ Red: $> 16.8$	I
Incidence of infectious diseases	3.3.1 Number of new HIV infections per 1,000 uninfected population	A 0.0417‰**	Green: $\leq 0.2$ Orange: $0.6 < x \leq 1$ Yellow: $0.2 < x \leq 0.6$ Red: $> 1$	I
	3.3.2 Tuberculosis incidence per 100,000 population	A 26.53**	Green: $\leq 10$ Orange: $42.5 < x \leq 75$ Yellow: $10 < x \leq 42.5$ Red: $> 75$	I
	3.3.3 Malaria incidence per 1,000 population	A 0**	0	II
	3.3.4 Hepatitis B incidence per 100,000 population	A 13.29**	68.74/100000	IV
	3.b.1 Coverage of vaccination including in national immunization programmes	R >97%**	Green: $\geq 90$ Orange: $85 > x \geq 80$ Yellow: $90 > x \geq 85$ Red: $< 80$	I
	3.1.2 Hospital delivery rate	R 100%**	Green: $\geq 98$ Orange: $94 > x \geq 90$ Yellow: $98 > x \geq 94$ Red: $< 90$	I
	3.7.1 Contraceptive rate of married women of reproductive age	R 92%**	Green: $\geq 80\%$ Orange: $65 > x \geq 50\%$ Yellow: $80 > x \geq 65\%$ Red: $< 50\%$	I
Medical service	3.8.1 Coverage of essential health services	R 100% of the residents can reach the village clinic in 15 mins, the town health center in 30 mins and the county general hospital in 55 mins.	Fully covered	V
	3.b.2 Government health expenditure as a proportion of GDP and government expenditure	R 0.83%** 7.59%*	1.87% 7.41%	IV
	3.c.1 The number of health workers per 1,000 population	A Health technical personnel: 7.56** Licensed physicians and physician assistants: 2.79** Registered nurses: 2.70**	6.12‰ 1.92‰ 2.54‰	IV

## Implementation

**Implement comprehensive health management, actively promote smart transportation construction, effectively reduce all types of mortality.** Deqing fully implemented comprehensive prevention and treatment of chronic diseases and free use of basic medicines for chronic diseases such as diabetes and high blood pressure. Mortality caused by cardiovascular disease, cancer, diabetes or chronic respiratory diseases has been maintained at a low level and gradually decreased. In 2017, the probability of early death

before age 70 dropped to 8.9%, maternal mortality achieved zero, and the mortality rate among children under 5 years old and newborns decreased to 2.89‰ and 0.89‰ respectively. Deqing performed an intelligently monitoring of key and special road sections, and reduced mortality caused by road traffic injuries to 6.98/100,000 in 2017. In the future, Deqing needs to strengthen health education, early diagnosis and early treatment, standard diagnosis and treatment, and other chronic diseases comprehensive prevention and treatment measures.

**Take comprehensive prevention and control measures to maintain a low incidence of infectious diseases, and a high rate of immunization program vaccination.** Vigorously carry out disease prevention and control, health information management, and health education and promotion, Deqing's incidence of reported incidence of statutory Class A and B infectious diseases was 145.83/100,000 in 2017. Immunization prevention was strengthened, and the vaccination rate incorporated into the national expanded immunization program vaccine has been maintained at 97% and above since 2010. HIV maintained a low prevalence rate. The tuberculosis epidemic showed a decreasing trend year by year.



Fig. 2-5 Infant Vaccination

**Develop full range of health service and achieve balanced coverage of medical service.** Deqing increases input in health services. All kinds of medical and health institutions are equipped well with a balanced spatial distribution and a stable reasonable allocation of health personnel. 100% of the residents can be accessed the county, town and village level medical institutions within 20 minutes. Deqing focused on family doctors' contracting service, highlighting key populations such as maternal, elderly, and chronically ill patients, and strengthening the management of basic public health service projects.

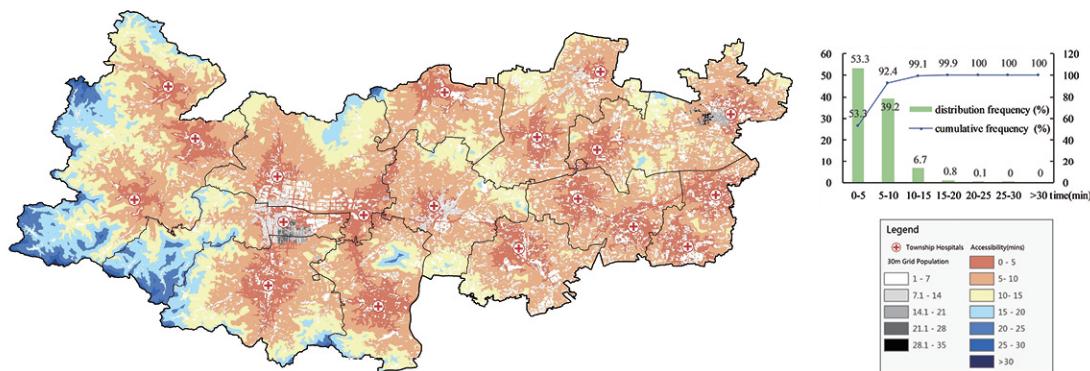


Fig. 2-6 Accessibility of Township Hospital Based on 30m Grid Population Density in Deqing  
Summary

Deqing rationally optimized the allocation and layout of medical resources, actively carried out disease prevention and control, and vigorously promoted comprehensive health management and all-round health services to effectively improve the residents' health and well-beings.

# 4 QUALITY EDUCATION



## [ Goal 4 ]

### Ensure an inclusive and equitable quality education and promote lifelong learning opportunities for all

#### Connotation and Indicators

SDG 4 aims to ensure universal access to quality education, increase educational opportunities, and promote and maintain educational equity. It covers two specific objectives, educational opportunities and education equilibrium.

- “Educational opportunities” focuses on the accessibility rate of compulsory education and high school education, including education consolidation rate, learning participation, school enrollment rate, school transition rates. Indicators used are 4.1.1, 4.2.2, 4.3.1, 4.4.1 and 4.6.1.
- “Education equilibrium” focuses on the allocation of educational resources, including educational facilities, education and training, the number of teachers. Indicators used are 4.5.1, 4.a.1 and 4.c.1 .

#### Quantification

SDG 4 includes 7 indicators, all of which are statistically calculated. Education accessibility is quantified in combination with statistical data and geospatial data.

Table 2–4 Quantified indicators for SDG 4

Content	Indicators		Quantitative result	Evaluation reference
Educational opportunity	4.1.1 Consolidation rate of primary/junior high school	R	100%**	95% II
	4.2.2 Gross enrollment ratio of preschool education	R	128.48%**	85% II
	4.3.1 Junior high school graduation rate/The scale ratio of common education and vocational education	R	99.10%** 1.11**	High school education basically popularizes V
	4.6.1 Net enrollment rate of primary school/junior high school and gross enrollment rate of high school	R	Net enrollment rate of primary school/junior high school: 100%** , 100%** gross enrollment rate of high school: 98.61%**	100% II 90% II
Educational balance	4.5.1 Gender Parity Index of Indicator 4.1.1	R	1**	1 II
	4.a.1 Proportion of schools with access to basic facilities and services	A	100%**	100% II
	4.c.1 Percentage of teachers who have received the organized teacher training pre-service or in-service required for teaching at the relevant level	A	100%**	100% V

## Implementation

**Popularize high-quality compulsory education, promote coordinated development of general vocational education. All school-age population can access education opportunities.** Deqing promoted the coordinated development of all kinds of education and realized the full coverage of kindergartens in towns. In 2017, the coverage of compulsory education standardized schools reached 97.4%, and the consolidation rate of obligation education was 100%. The net enrollment rate of the three years before the formal enrollment of primary schools, the proportion of junior high school graduates entering senior high school and gross enrollment rate of senior high school reached 99.38%, 99.10% and 98.61%. General education and vocational education is developed in a balanced manner and compulsory education is highly penetration in Deqing.



Fig. 2-7 Primary School Campus Culture



Fig. 2-8 Vocational High School Education

**Accelerate the integration of urban and rural education, strengthen the optimal allocation of educational resources, and promote the development of education to quality and balance.** Deqing optimized school layout and teacher resource allocation, narrowed gap between urban and rural areas, innovated special education individualized teaching model, ensured the right to education of vulnerable groups. Campus network, electronic whiteboard, video classroom, drinking water taps and other campus infrastructure have achieved fully covered. The most distinctive feature is that school buses connect primary school education artery. This greatly enhanced the accessibility of educational resources and achieved spatial extension of high-quality resources. Deqing implemented teachers training program, promoted elite urban teachers' and rural teashers' exchange, as well as enhanced the balanced development of all kinds of education.

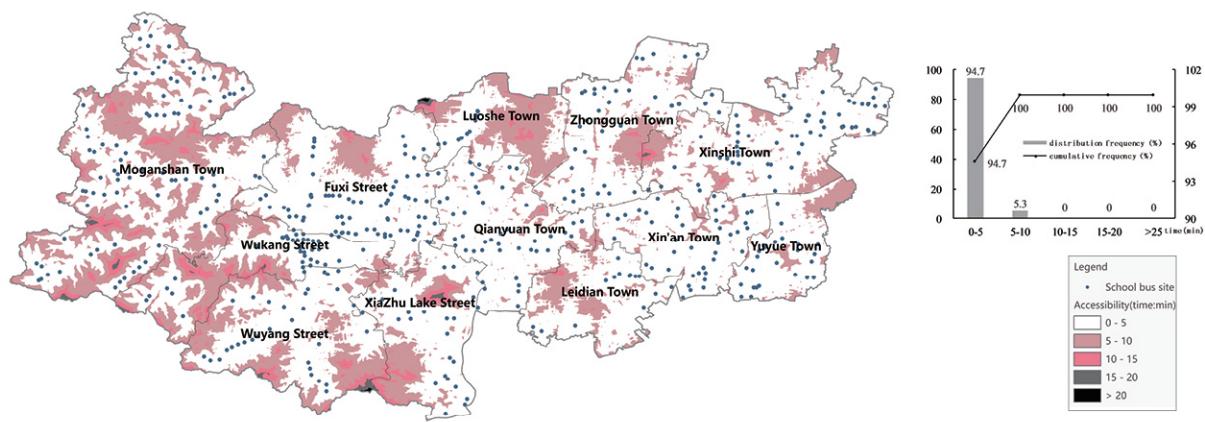


Fig. 2-9 Accessibility of School Bus Station

## Summary

Deqing has high-quality compulsory education, optimized the allocation of educational resources, promoted the integration of urban and rural education and diversified high-quality development of all kinds of education. Everyone can share the high-quality and balanced development of education in Deqing.



## [ Goal 5 ]

### Achieve gender equality and empower all women and girls

#### Connotation and Indicators

SDG 5 aims to promote gender equality and guarantee women's and girls' equal rights to men. It covers 3 specific objectives, including legal protection, decision management and women's rights.

- ◆ "Legal protection" focuses on protection of gender equality and women's rights by national laws and regulations, including whether a legal framework has been established to promote, implement and supervise the equality and non-discrimination on the gender. Indicator 5.1.1 is used to analyze the protection of gender equality and women's and girls' rights.
- ◆ "Decision Management" focuses on whether women can effectively participate in the management of political, economic and public affairs at all levels, specifically including women's participation in politics and women's occupation of management positions. Indicators used are 5.5.1 and 5.5.2.
- ◆ "Women's Rights" focuses on health security, specifically refers to the proportion of maternal and child health expenditure/family planning expenditure in government health expenditure and the improvement of women's reproductive health. The indicator used is 5.c.1.

#### Quantification

The 4 indicators of SDG 5 are quantitatively evaluated using statistical methods.

Table 2-5 Quantified indicators for SDG 5

Content	Indicators	Quantitative result	Evaluation reference
Legal protection	5.1.1 Whether or not legal frameworks are followed to promote, enforce and monitor equality and non-discrimination on the basis of sex	A Under the relevant national laws	Active Implementation of Chinese law
Participation in decision-making	5.5.1 Proportion of women deputies in the county People's congress and members in the county committee of Chinese People's Political Consultative Conference (CPPCC)	A Deputies to the county People's congress : 31.22%**; Members of the county CPPCC: 32.09%**	Green: ≥40 Yellow: 40>x≥30 Orange: 30>x≥20 Red: <20
	5.5.2 Proportion of women in managerial positions	A Cadre: 35.1%** Board of directors: 34.2%** Regulatory committee: 40.1%** Village committee: 33.4%**	I
Health Security	5.c.1 Proportion of maternal and child health care funds to government health expenditure and proportion of family planning funds to government health expenditure	R Maternal and child health care: 4.62% Family planning: 5.62%	

## Implementation



Fig. 2-10 Women Representatives in Election

**Implement relevant laws and regulations actively, strengthen the protection of women's rights continuously.** Follow the national laws and regulations that guarantee women's rights and promote gender equality, and guarantee women's equal rights with men in political, economic, cultural, social and family life. Deqing incorporated gender equality into reform and decision-making, established a gender equality consultation and evaluation mechanism in county policy documents, and promulgated the

"Implementation Measures for Defence of Family Violence in Deqing County (Trial)". The awareness rate of women's rights protection knowledge has increased from 80% in 2012 to 87% in 2016, and women's legal rights have been effectively guaranteed.

**Broaden the scope and ways of women's participation in grass-root management, and raise the number of women in management positions to one-third.** Deqing paid attention to the role of women in the people's congresses and political consultative conference and took the training and selection of female cadres into all the overall planning of the construction of cadres. In 2017, the proportion of female deputy in the people's congress and political consultative conference was 31.22% and 32.09%, with an increase of 9.3% and 9.2% respectively compared with 2011. The proportion of female cadres in the total cadres increased from 28.1% in 2011 to 35.1% in 2017. In 2017, the proportion of women among village committee members was 33.4%. In 2017, the proportion of female employee directors in corporate boards was 34.2%, and the proportion of female staff supervisors in the supervisory board of enterprises was 40.1%, which increased by 1.4 and 6.6% respectively compared with 2011. Deqing fundamentally achieved the equality of women in political and economic social life and let women play an important role in politics, economy and society fully.

**Increase funding investment, build a more complete network of maternal and child health services, and further ensure women's reproductive health.** Deqing introduced public health policy to protect women's rights, constructed three levels of maternal and child health care network in counties, towns and villages, and promoted the construction of special family support, couple eugenics, women's health and other public health service projects for children and women. In 2016, maternal and child health and family planning funds accounted for 4.62%, 5.62% respectively. Deqing ensured that women enjoyed good reproductive health services throughout their childbearing period, completed full coverage examination of cervical cancer and breast cancer for women, and comprehensively and effectively prevented and controlled the transmission of AIDS and STD. Women's reproductive health

is effectively guaranteed and the level of maternal and child health services is constantly improving in Deqing.



Fig. 2-11 Public Mother and Baby Room in Deqing



Fig. 2-12 Pregnant Women's Classroom in Deqing

## Summary

Deqing conscientiously implemented relevant laws and regulations, deeply promoted the allocation of maternal and child health resources, improved the service network, protected the rights of women, paid attention to the status and role of women in political, economic and social development, and promoted gender equality. In the future, it is necessary to strengthen vocational skills training for women, to improve the selection of female cadres and to increase women's opportunities and participation in the management of political, economic and social affairs.

## 6 CLEAN WATER AND SANITATION



### [ Goal 6 ]

#### Ensure availability and sustainable management of water and sanitation for all

##### Connotation and Indicators

SDG 6 aims to solve the problem of drinking water and sanitation, water resource and water quality, and wading ecosystems to the maximum extent through sustainable management without damaging the sustainability of ecosystems. It covers 3 specific objectives, including safe drinking water and sanitation, water resources utilization and protection of wading ecosystems.

- ◆ "Safe drinking water and sanitation" focuses on equitable access to safe drinking water and sanitation services for all, including tap water penetration and sanitary toilet services in rural, urban and public places, Indicators 6.1.1 and 6.2.1 are used.
- ◆ "Water resources utilization" focuses on improving water quality, improving water use efficiency and strengthening water resources management, including total water resources, good water standard-reaching rate, water use efficiency and water shortage pressure, etc. Indicators 6.3.1, 6.3.2, 6.4.1, 6.4.2 are used.
- ◆ "Protection of wading ecosystems" focuses on the function change of wading ecosystem over time, analyzing the sustainability of wading ecosystem through the area, quantity, quality and health status of the wading ecosystem. Indicator 6.6.1 is used.

##### Quantification

SDG 6 includes 7 indicators. Indicators of 6.2.1 and 6.6.1 are quantified in combination with statistical data and geospatial data, and the remaining indicators are quantified by statistical data.

Table 2-6 Quantified indicators for SDG 6

Content	Indicators		Quantitative result	Evaluation reference	
clean water	6.1.1 Proportion of population using safely managed drinking water services	A	Urban: 100% Rural: 99.6%	Green: ≥98% Yellow: 98%>x≥89% Orange: 89%>x≥80% Red: <80%	I
	6.2.1 Proportion of population using safely managed sanitation services				
	6.2.1.a Penetration rate of sanitary toilets in rural areas	E	98%	Green: ≥95 Yellow: 95%>x≥85 Orange: 85%>x≥75 Red: <75	I
	6.2.1.b Service convenience of urban public toilets		From all parts of town, the nearest public toilet can be reached within 16 minutes		

Content	Indicators	Quantitative result	Evaluation reference
Volume, quality and efficiency of water resources	6.3.1 Proportion of wastewater safely treated	Urban domestic sewage:91.06%	Municipal domestic sewage: 92.4%; IV
		A Rural domestic sewage:80.68%	Coverage rate of the treatment of domestic wastewater (upper-middle-income countries):59%; III
		Trade effluent:N/A	
	6.3.2 Proportion of bodies of water with good ambient water quality	A 68.75%,100%**	76.9% IV
	6.4.1 Change in water-use efficiency over time	A The water consumption per 10,000 CNY of GDP in 2017 was 65.7m <sup>3</sup> ,dropped 23.52% from 2015	By 2020, the efficiency of water use will be 23% lower than that of 2015 II
sustainability of water-related ecosystems	6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	A 25.08%	Green: ≤25 Yellow: 25<x≤50 Orange: 50<x≤75 Red: <75 I
	6.6.1 Change in the extent of water-related ecosystems over time	6.47%	
	6.6.1.a Rate of change in the spatial extent of water-related ecosystems	11.14%	0-20%: Highly sustainable; 21-40%: Locally sustainable but threatens global stability;
	6.6.1.b Rate of change in the water quantity characteristic of water-related ecosystems	E 8.26%	41-60%: Border-line sustainability. Corrective actions are strongly recommended; 61-100%: Unsustainable Urgent renewal is required. III
	6.6.1.c Rate of change in the water quality of water-related ecosystems	0%	
	6.6.1.d Health status of the typical wetland ecosystem	Xiazhuhu wetland: well	

## Implementation

**Protect drinking water sources, implement "civilized public toilets" action, and achieve full coverage of safely managed drinking water and sanitation services.** Deqing strictly implemented zoning of water environmental function and protection of drinking water source. Urban and rural tap water penetration rate reached 100% and 99.6% respectively. The public health facilities are convenient. There are 144 public toilets in urban district and the number of possession per ten thousand people was 7. Starting from all parts of the town, 100% of the urban residents can get access to public toilets in 16 minutes. After harmless transformation and "civilized public toilet" action, rural sanitary toilet popularity rate reached 98%. In the future, Deqing should strive to increase the number of public toilets, promote the standardization, normalization and intelligentization of public toilet management.

**Improve sewage treatment system, promote comprehensive management of water environment, and the water consumption of 10,000 yuan(1,538 \$) GDP dropped by one third in the past five years (2012–2016).** By way of "Five-water Co-treatment" (water pollution, flood prevention, drainage water, water supply and water conservation), 91.06% of municipal domestic sewage (including municipal water) were treated so as to improve the water quality. Deqing solved the problem of rural domestic sewage treatment through "one pipe connects to the end" and achieved full coverage of rural domestic sewage treatment. In addition, Deqing sped up the construction of water-saving society. The water consumption per 10,000 yuan (1,538 \$)GDP dropped by 31.09% in the past five years(2012-2016). The breeding tail water was ecologically recycled and reused, and 1522 farming tail water treatment stations covered all villages.

**Control the total amount of water consumption, systematically monitor and manage water consumption. The degree of deviation from original wading ecosystem was 6.47%.** Deqing set up "River (lake) chief system" to implement the strictest water resources management system. The degree of deviation from original water area and flows are slightly fluctuated in the past 35 years. The spatial change rate was 11.14%. Water bodies of 16 monitored all met the standards. Water ecology has been effectively improved.

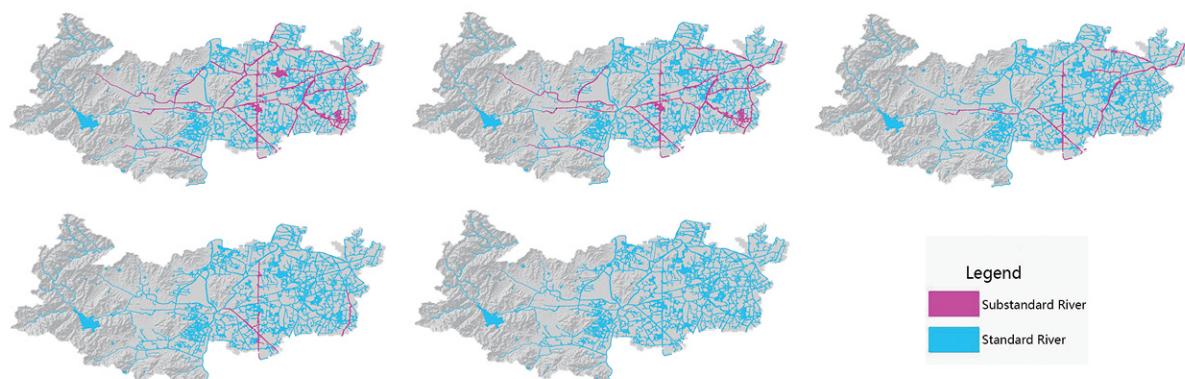


Fig.2-13 The Ratio of Fine Water Bodies and its Changing Trend (2013–2017)

## Summary

Through effective "Five-water Co-treatment" measurement, Deqing achieved full coverage of safe management of drinking water and environmental sanitation services. The quality and efficiency of water resources improved significantly, and sustainability of wading ecosystems increased significantly. In view of the current water using pressure, it is necessary to further promote the transformation of industrial structure and improve water use efficiency.

## 7 AFFORDABLE AND CLEAN ENERGY



## [ Goal 7 ]

**Ensure access to affordable, reliable, sustainable and modern energy for all**

## Connotation and Indicators

SDG 7 aims at accelerating transition to an affordable, reliable and sustainable energy system from two dimensions including modern energy services and energy efficiency, through the promotion of clean energy technologies, the expansion of infrastructure construction, investment in renewable sources and the optimization of energy-saving practices.

- ◆ "Modern energy services" emphasizes that everyone should have access to household energy services. Indicator 7.1.1 and 7.1.2 are used to assess basic power services and the coverage of residents who are benefited from clean cooking fuels and technologies.
- ◆ The focus of "Energy efficiency" is put on energy restructuring and energy efficiency improvement. Indicator 7.3.1 is used to measure the industrial energy conservation and emission reduction situation of Deqing.

## Quantification

SDG 7 includes 3 indicators, all of them are calculated using statistical data.

Table 2-7 Quantified Indicators for SDG 7

Content	Indicators	Quantitative result	Evaluation reference	
Percentage of residents enjoying benefits	7.1.1 Proportion of population with access to electricity	A 100%	Green: $\geq 98$ Yellow: $98 > x \geq 89$ Orange: $89 > x \geq 80$ Red: $< 80$	I
	7.1.2 Proportion of population with primary reliance on clean fuels and technology	A Access to gas: 100%	Green: $\geq 85$ Yellow: $85 > x \geq 67.5$ Orange: $67.5 > x \geq 50$ Red: $< 50$	I
Energy conservation and emission reduction of Industry	7.3.1 Energy intensity and rate of change measured in terms of primary energy and GDP	A Energy intensity: 0.54 tons of standard coal/ 10,000CNY  Rate of change: -3.6%	0.59 tons of standard coal/ 10,000CNY  During 2016-2030, Global energy intensity will fall by 2.7% every year.	III

## Implementation

**Through the development of clean energy, the upgrading of power distribution network, Deqing has achieved full coverage of power and gas across the county.** Deqing has improved the construction of energy infrastructure network, vigorously developed renewable energy, promoted the use of clean fuels and technologies, and achieved 100% coverage of the power and gas services (petroleum liquefied gas and natural gas) across the county. Deqing has vigorously promoted household rooftop photovoltaic engineering in rural areas and developed new energy vehicles. The number of household rooftop photovoltaic in rural area in 2016 was 39 times the number in 2012. In 2016, the number of new energy buses was 58 vehicles. The application of modern energy technology started late in Deqing, and it is necessary to further improve infrastructure, management and service mechanisms, and accelerate the integration of urban and rural natural gas facilities.



Fig. 2-14 Deqing Rural Rooftop Photovoltaic Installation



Fig. 2-15 New-energy Bus

**Accelerate the adjustment of energy structure, implement energy “double control” management, and reduce energy intensity by one third in seven years.** By expanding natural gas utilization, developing green transportation, guiding and expanding photovoltaic and biomass energy applications, and accelerating the substitution of coal consumption, urban built-up areas have completely eliminated the traditional high-polluting small boilers of coal-fired mode. In 2017, coal consumption decreased to less than 50% in primary energy consumption. Implement regional energy conservation assessment, and vigorously promote energy conservation and emission reduction in key fields and industries. The energy intensity in 2011-2017 decreased by 32.39%. Due to the large proportion of energy-intensive industries like building materials and non-ferrous metal smelting in Deqing County, the energy consumption per unit of output value is relatively high. In 2016, the energy intensity of Deqing was 0.54 tons of standard coal per 10,000 yuan (1538\$), yet there is still a large room for decline.



Fig. 2-16 Elimination of Outdated Production Factory

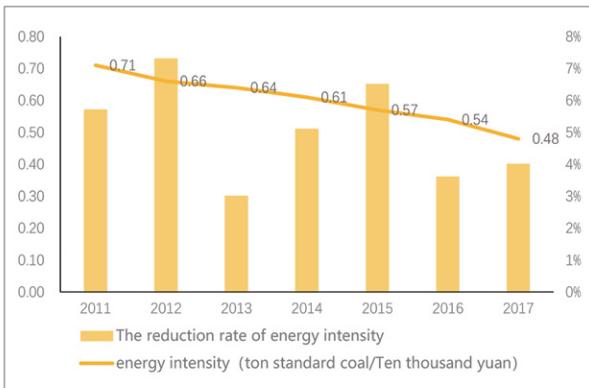


Fig. 2-17 The Trend of Energy Intensity

## Summary

Deqing has improved the construction of energy infrastructure, promoted the use of clean fuels and new energy technologies, and implemented "double control" management of unit energy consumption and total capacity of energy use. Deqing has achieved a full coverage of power and gas services across the whole county. Although the energy intensity declines year by year, there is still a large room for improvement. It is necessary to further optimize energy structure and gradually come to an affordable, reliable and sustainable energy system.

## 8 DECENT WORK AND ECONOMIC GROWTH

### [ Goal 8 ]



#### Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

##### Connotation and Indicators

Economic growth is a major driving force for sustainable development, and full employment is an important means to alleviate poverty. SDG 8 compromises four specific objectives, including economic growth, productivity, growth condition, employment promotion and labor security.

- ◆ "Economic growth" focuses on the analysis of major economic activities and economic growth rates, including annual GDP growth rates and tourism development. Indicators 8.1.1 and 8.9.1 are used.
- ◆ "Productivity" focuses on the analysis of labor productivity, specifically referring to the annual growth rate of GDP per capita. Indicator 8.2.1 is employed.
- ◆ "Growth conditions" analyzes vocational education and finance. Indicator 8.6.1 is adopted to quantitatively evaluate adult education situation.
- ◆ "Promotion of employment and labor security" focuses on the analysis of employment, including unemployment rate and tourism sector employment. Indicators used are 8.5.2 and 8.9.2.

##### Quantification

The 6 indicators of SDG 8 are calculated using statistical data.

Table 2–8 Quantified Indicators for SDG 8

Content	Indicators		Quantitative result	Evaluation reference
Economic growth rate	8.1.1 Annual growth rate of per capita GDP	A	8.94%	green: $\geq 0$ yellow: $0 > x \geq -1$ orange: $-1 > x \geq -2$ red: $< -2$
	8.9.1 Direct tourism value added as a proportion of GDP	A	7.50%	
Labor productivity	8.2.1 Annual growth rate of GDP Per employee	A	9.75%	6.11%
Vocational education and Finance	8.6.1 Number of enrollment and graduates in adult education in the same year	S	5485 2373	IV
Employment	8.5.2 Registered unemployment rate	R	2.61%	
	8.9.2 Employment in tourism	S	34388**	III

##### Implementation

**Deqing has been driving sustainable development with industrial transformation and scient (2012–2016).** Taking industrial transformation and upgrading as a breakthrough, and promoting the



Fig. 2-18 Villagers are Working at "Hill Stations" in Deqing

elimination of backwardness, the development of newly-developing sectors, ecological agriculture and ecotourism. In 2016, the value added of the strategic emerging industries and the high-tech industry accounted for 22% and 51.6% of the total value added in designed-size industries, respectively. Deqing has vigorously developed the "research Institute economy", attracting 14 domestic and foreign industry research institute

of universities and research institutes settled here. In the 2017, Deqing has embraced 159 enterprises centering on the geospatial information, which achieved output value of 6.58 billion yuan (1 billion US dollars), tax 463 million yuan (71.23 million US dollars).

**Deqing has increased intensive techniques and capital input, leading to a good condition of the growth of labor productivity.** Deqing has actively upgraded and enhanced traditional manufacturing industries by guiding enterprises to increase technical investment, renovating high pollution, low output small enterprises and promoting industrial parks. In addition, Deqing has developed emerging industries with digital economy as the core, as well as green and beautiful agriculture and high-end eco-tourism. In 2016, the actual per capita GDP of the employees grew at an annual rate of 9.75%.

**Deqing has developed vocational education, increased financial support and provided growth conditions for various industries.** Deqing has actively promoted adult education and vocational training, with the number of registered adult education in 2016 reaching 5485. Deqing also formed piano manufacturing industry association and established the first homestay College in China to train highly skilled professionals. On top of that, Deqing gives full play to the role of finance in promoting the economy and actively provides financial support to enterprises. In 2016 new private financing raised to 40 billion yuan (6.2 billion US dollars), and the non-performing loan ratio maintained at 0.63%. In addition, Deqing is guiding the financial industry to support the development of geospatial information town in all aspects. A fund with 200 million yuan (30.76 million US dollars) innovative venture capital for geospatial Information has been established, and the establishment of a sub fund for drones is in preparation.

**Deqing has promoted employment and reduced unemployment through development, pushing decent employment for all.** Deqing provides a large number of high-quality jobs by expanding emerging industries, developing ecological agriculture and enhancing the modern service industry. Eco-tourism, represented by "Hill Station", thrives, creating a large number of employment opportunities, promoting the return of labor force and raising income. In 2016, the number of new urban employees was 17000, 5637 unemployed persons got re-employed, and urban registered unemployment rate was controlled at

a low level of 2.61%.

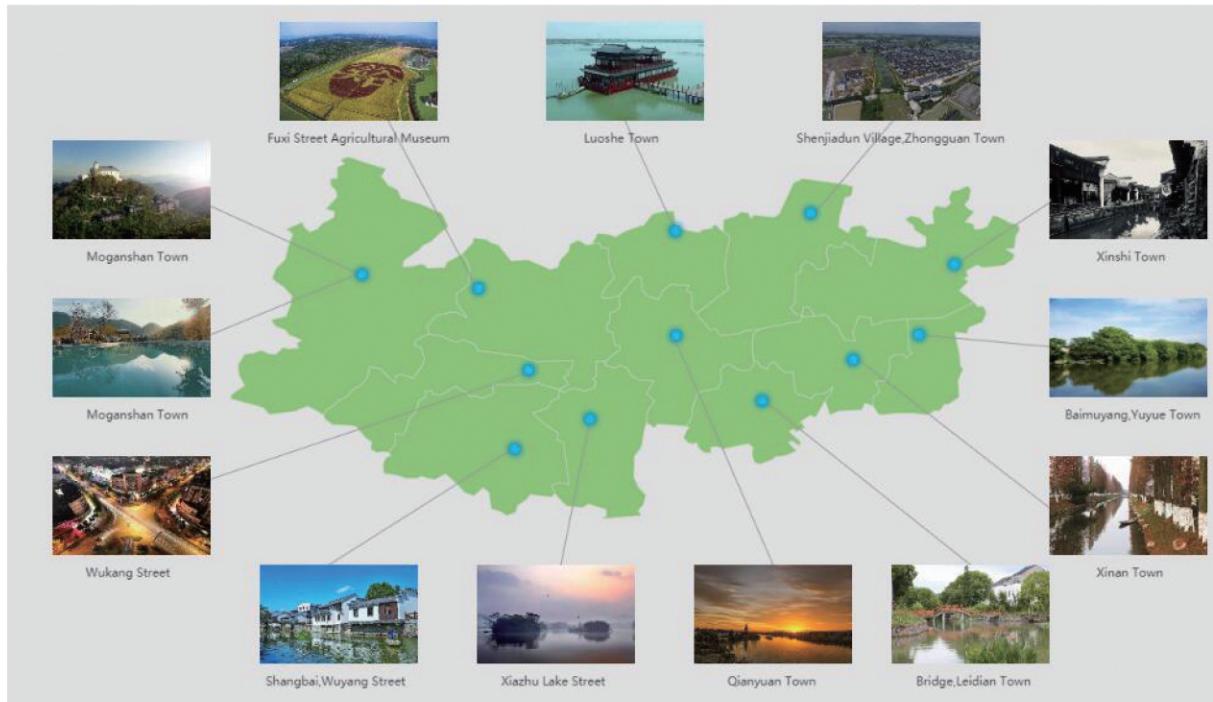


Fig. 2-19 Many Eco-tourism Attractions in Deqing to Increase Employment

## Summary

Relying on scientific and technological innovation to promote industrial transformation, Deqing is building a sustainable growth model. In addition, Deqing has boosted technology investment, promoted the development of emerging industries, developed vocational education and strengthened the role of financial support to improve the conditions for economic development. Furthermore, Deqing has promoted employment through development to ensure lasting, inclusive and sustainable economic growth.

## 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

## [ Goal 9 ]



## Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

### Connotation and Indicators

Infrastructure construction, industry and innovation are three pillars of economic development. SDG 9 has three objectives, including resilient infrastructure, inclusive sustainable industrialization and scientific and technological innovation.

- ◆ "Resilient infrastructure" focuses on the construction of transport and communications facilities, including proportion of districts covered by all-season road, road density, passage time, passenger and freight volumes, proportion of population covered by a mobile network, etc. Indicators used are 9.1.1, 9.1.2 and 9.c.1.
- ◆ "Sustainable industrialization" focuses on the development of manufacturing industries and small middle enterprises (SMEs), including manufacturing output value, the value added of SMEs, the number of manufacturing employees, the efficiency of the enterprise resources use and the use of clean and environmental-friendly technologies. Indicators used are 9.2.1, 9.2.2 and 9.3.1.
- ◆ "Science and Technology innovation" focuses on the scientific and technological innovation ability of industry, including scientific research investment, the number of scientific researchers, the development of high-tech industry, etc. Indicators 9.5.1, 9.5.2 and 9.b.1 are used.

### Quantification

SDG 9 includes 9 indicators. Indicator 9.1.1 is quantitatively calculated combining the statistical data with geospatial information, and the remaining indicators are quantified by statistical methods.

Table 2-9 Quantified Indicators for SDG 9

Content	Indicators	Quantitative result	Evaluation reference
Transportation and communication facilities	9.1.1 Levels of transport infrastructure development		
	9.1.1.a Proportion of the rural population who live within 2 km of an all-season road	100%	
	9.1.1.b Road Density	1.2km/km <sup>2</sup>	≥0.49km/km <sup>2</sup>
	9.1.1.c Weighted average travel time	Maximum: 4.39 hours**	From 5.23 hours in 2014 to 4.39 hours in 2017
	9.1.2 Volume of passenger and freight transport	Passenger: 11.47 million Freight volume: 21.08 million tons Compared with 2012, passenger traffic decreased by 19.45%, and freight traffic decreased by 7.26%.	Compared with 2012, the national passenger traffic decreased by 56.2%, and the freight volume increased by 9.1%. IV

Content	Indicators		Quantitative result	Evaluation reference	
Transportation and communication facilities	9.c.1 Proportion of mobile phone users in total population	R	115%*	Mobile phone penetration rate 95.6%	IV
	9.2.1 Value added of manufacturing above designated size as a proportion of GDP in industry and per capita	R	Proportion 45.4%* Per capita value 40 thousand CNY/person*	Proportion 45.4%* Per capita value 40 thousand CNY/person*	IV
Manufacturing and small businesses	9.2.2 Manufacturing Employment as a Proportion of Total Employment (Excluding Private Companies)	R	60.90%	27.4%	IV
	9.3.1 Proportion of small-scale industries in total industrial added value in industry above designated size	R	61.60%		
	9.5.1 Research and Development Expenditure as a Proportion of GDP	A	2.70%	green: $\geq 1.5$ yellow: $1.5 > x \geq 1.25$ orange: $1.25 > x \geq 1$ red: $< 1$	I
Ability to innovation	9.5.2 Researchers (in full-time Equivalent) per Million Inhabitants	A	9075	green: $\geq 8000$ yellow: $8000 > x \geq 7500$ orange: $7500 > x \geq 7000$ red: $< 7000$	I
	9.b.1 Proportion of High-tech Industry Value Added in Total Industrial Value Added above Designated Size	R	49.60%		

## Implementation

**Vigorously implemented road upgrading and renovation projects, accelerated the interconnection with Shanghai–Hangzhou transportation and further improved the infrastructure network.** Deqing has actively implemented the road upgrading project. In 2014, all of the roads have been upgraded to classified highway. In 2016, the road density reached  $1.2\text{km}/\text{km}^2$ , more than twice of the national average. In 2017, 500-meter service coverage of classified highway covers more than 90% of the region, and the distance from settlements to hardened roads is less than 350m. The traveling condition of the county residents has been greatly improved. It takes merely 13 minutes from Deqing to Hangzhou by high-speed railway thanks to the construction of fast corridor connecting Shanghai and Hangzhou, presenting the further integration of the neighboring cities. Deqing has vigorously improved the navigating conditions of inland waterways of Beijing-Hangzhou Canal, aiming to take the advantage of water transport to reduce the logistics costs of local enterprises and attract advanced manufacturing to settle in Deqing. In the future, Deqing should continue to promote the integration into the traffic corridor of Yangtze River Delta region.

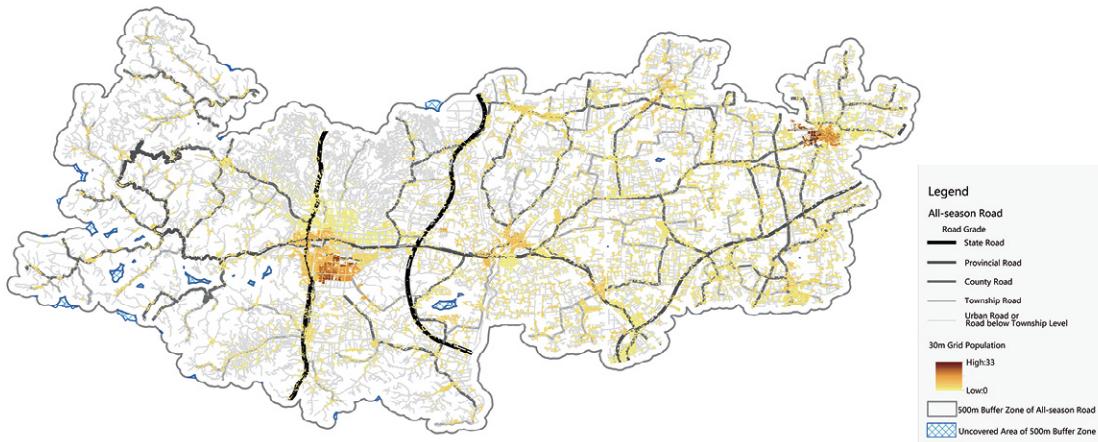


Fig. 2–20 500m Buffer of the Hardened Road in Deqing

**Transforming from "manufacturing" to "qualitative" and "intellectual" creation, and to a "3+x" industry system.** Aimed at two major priorities of industrial structure optimization and green development, Deqing gradually formed the "3+x" industrial system with equipment manufacturing, biomedicine and green household as the leading industries and geospatial information, general aviation and artificial intelligence as strategic emerging industries. The value added of manufacturing industries has grown steadily. Deqing has implemented policies like three-year growth plan for small and micro enterprises. The value added of small enterprise above designated size compose 61.6% of the total value added. By using high-tech, low-energy equipment and technology, the energy consumption per unit of GDP had been reduced. Deqing's future industrial sustainable development will be focused on promoting the quality of leading industries and developing emerging industries such as artificial intelligence.

**Deepening the "industry–university–research" mode for science and technology innovation, and making a percentage of 2.7% of R&D expenditure in total regional output value in 2016.** Based on Mogan Mountain of Huzhou High-tech Industry Development Zone, Deqing is creating an all-round chain with "creative space + incubator + Accelerator + Industrial Park". In 2016, the number of R&D personnel per thousand employed people was 12.52, the number of high-tech enterprises supported by the state was more than 100, the rate of output value of new products increased to 33.7%, the number of intellectual property patent authorized was 2142, including 486 pieces of patent for invention. Deqing is listed in 100 domestic science and technology innovation counties and national scientific and technological achievements transformation model county. Scientific and technological innovation has become an engine for Deqing to achieve sustainable development.



Dingli machinery manufacturing factory, a domestic leading enterprise of intelligent ascending equipment



Hua Ying Electronics, a representative enterprise with "industry–university–research" mode in Deqing

Fig. 2–21 Well-known Manufacturing Enterprises in Deqing

## Summary

Deqing has vigorously upgraded the road network facilities, actively promoted "connecting with Shanghai and Hangzhou", and further improved the infrastructure, forming an important basis for industrialization. Deqing created a "3+x" industrial system and deepened the "industry-university-research" mode, significantly enhancing the ability of scientific and technological innovation and providing guarantees for economic growth and sustainable industrial development. It is of importance that a more efficient use of resources in Deqing would be appreciated to meet the need of sustainable industrialization.



## [ Goal 10 ]

## **Reduce inequality within and among countries**

## Connotations and Indicators

Sustainable development should be balanced, coordinated and inclusive development, of which reducing inequality is an important goal. SDG 10 includes two objectives, including income equality and condition equality.

- ◆ "Income equality" focuses on urban-rural equality, including differences in the growth of urban-rural income and in the Engel coefficient between urban and rural areas. Indicators of 10.1.1.a, 10.1.1.b and 10.2.1 are used.
  - ◆ "Conditional equality" stresses on the importance of policy and surveillance, including household registration reform, basic public services, infrastructure, social security, etc. Materials based on investigation and research are combined for qualitative analysis.

## Quantification

Both of the two indicators of SDG 10 are calculated by statistical data.

Table 2–10 Quantified Indicators for SDG 10

Content	Indicators		Quantitative result	Evaluation reference
Urban and rural equality	10.1.1 Growth rate of per capita disposable income in urban and rural areas	R	Urban: 8.87% Rural: 8.85%	Urban: 7.8%
	10.2.1 Comparison of income and expenditure between urban and rural areas			
	10.2.1.a Per capita disposable income ratio between urban and rural areas	S	1.71	2.72
	10.2.1.b Comparison of Engel coefficient between urban and rural areas		Urban: 28.2% Rural: 25.5%	Urban: 29.3% Rural: 28.9%

## Implementation

**Continuously created the ecological dividend and narrowed the income gap between urban and rural areas, and reduced the ratio of income per capita to 1.71.** Rewarded as a national ecological county, Deqing continues to develop a better economy and promotes the development of rural economy, especially a large number of international leisure and tourism projects—"Hill Station", of which the homestay industry can produce benefits of more than 190,000 yuan (2,9231\$) per year per bed. Moreover, the average price of a rural house in the western mountainous area is 50,000 (9692\$) yuan per year, which leads to the rapid growth of rural residents' income. In 2016, the ratio of urban and rural income was reduced to 1.71 along with an extremely close Engel coefficient, indicating a narrowing

gap of income and consumption levels between urban and rural areas. The fact that favorable ecology can facilitate economic development offers Deqing County a great experience.



Fig. 2-22 Comparison of Homestays Before and After Renovation



Fig. 2-23 Over View of the Urban–Rural Integration in Deqing

**Carried out household registration reform to promote urban–rural integration, and to equalize basic public services in urban and rural areas.** Deqing has implemented household registration reform to eliminate the division between agriculture and non-agriculture, and unify all households as "resident household", which means rural and urban households can enjoy the same status. In addition, Deqing is implementing "integration of multiple planning" by combining the county master planning, land use planning and industrial development planning. As a standardization pilot for urban-rural integrated development in China, Deqing is actively cracking the difference between urban and rural treatment, so as to achieve integration of urban and rural pension, medical care, housing security. Furthermore, this county is trying to balance the allocation of educational resources and is awarded as one of the counties that first achieve basic equilibrium of compulsory education development. Additionally, Deqing has achieved urban and rural integration in terms of infrastructures like public transport, garbage sorting treatment and sewage treatment. The water and electricity supply are basically of the same source, network, quality and price.



Fig. 2-24 Integration of Urban and Rural Sanitation Infrastructures



Fig. 2-25 Integration of Urban and Rural Sewage Treatment Facilities

## Summary

Aiming to become a harmonious county, Deqing made efforts to create ecological dividend and to promote development with favorable ecology. The implementation of household registration reform, the promotion of urban-rural infrastructure integration and the reduction of the difference between urban and rural basic public services are of significance to balance the development of urban and rural areas.

## 11 SUSTAINABLE CITIES AND COMMUNITIES



### [ Goal 11 ]

## Make cities and human settlements inclusive, safe, resilient and sustainable

### Connotations and Indicators

SDG 11 aims to solve the problems that seriously hinder the sustainable development of cities in the process of urbanization, such as disorderly urban expansion, poor living conditions and air pollution, so as to build a healthy, safe and livable city and optimize the habitat environment. Three objectives are housing security, habitat environment, and residential security.

- ◆ "Living conditions" focuses on housing conditions, including the proportion of slums and informal settlements, the relationship between land use and population growth rates. Indicators used 11.1.1 and 11.3.1.
- ◆ "Habitat environment" concerns living environment, including the public transport accessibility level (PTAL), urban public spaces and public cultural services. Indicators 11.2.1, 11.7.1 and 11.4.1 are employed .
- ◆ "Residential security" stresses safe settlement, including death rates from natural disasters, disaster losses, urban pollution, etc. Indicators used are 11.5.1, 11.5.2, 11.6.1 and 11.6.2.

### Quantification

SDG 11 has 9 indicators. The indicators 11.2.1, 11.3.1 and 11.7.1 are calculated by combining the statistical data with geospatial information, and the rest are calculated with statistical data.

Table 2–11 Quantified Indicators for SDG 11

Content	Indicators	Quantitative Results	References
Housing condition	11.1.1 Proportion of people living in slums, informal settlements, or inadequate housing.	A 0.59% *	Average in world: 23%; Average in east and south-eastern Asia: 28% III
	11.3.1 Ratio of land consumption rate to population growth rate.	A 2005-2010: 1.27 2010-2015: 1.17	Average in world: 1.28; Average in east Asia: 1.64 III
Living environment	11.2.1 Proportion of population that has convenient access to public transport	A county average is 44% Build-up average is 71%	Average in Sweden <sup>2</sup> : 80%; Average in European build-up: 94% V
	11.7.1 Average share of the built-up area of cities that is open space for public use for all, proportion of green space to built-up area and per capita green lands of parks	E Per capita public open space: 8.63 m <sup>2</sup>	Green: >1.5 Yellow: 1.1<x≤1.5 Red: <1.1 I
		E Proportion of green space to build-up area: 38%	II
		E Per capita green lands of parks: 15.3 m <sup>2</sup>	II

<sup>2</sup> SE: Indicator 11.2.1 – Proportion of population that has convenient access to public transport, by sex, age and persons with disabilities, Geostat 3 WP2 report, Statistisk sentralbyrå

Content	Indicators	Quantitative Results	References	
Safety settlements	11.4.1 Proportion of public expenditure on the preservation, protection and conservation of all cultural and natural heritage.	A 2.62%	1.7%	IV
	11.5.1 Numbers of deaths, missing persons and persons affected by disasters per 100,000 people.	A Deaths and missing people:0 People affected by disasters: 820		
	11.5.2 Direct disaster economic loss	A 92 Million CNY		
	11.6.1 Proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste	A Proportion of industrial solid waste collected: 93%; Proportion of domestic waste treated: 100%	69.3%	IV
	11.6.2 Annual mean levels of the fine particulate matter (PM2.5) in cities and the decrease proportion of days with heavy air pollution	A Annual mean levels of PM2.5: 9.29 $\mu\text{g}/\text{m}^3$ **  A Decrease proportion of days with heavy air pollution in 2017 (than 2014): -20.4% **	Green: $\leq 10$ Yellow: $10 < x \leq 17.5$ Orange: $17.5 < x \leq 25$ Red: $> 25$  By 2020, the decrease proportion of days with heavy air pollution is -25%	I II

## Implementation

**Led by rational urban planning, the living condition has been significantly improved, and the proportion of the urban population with insufficient housing is close to that of developed countries.** Deqing focuses more on regulating, leading and restraining urban construction, and the ratio of land consumption rate for urban and rural construction to population growth rate has maintained at a reasonable level (at 1.27-1.17 during 2005-2015). Deqing is strengthening housing security construction by fully and dynamically monitoring old and dilapidated houses in urban areas. The proportion of urban population with insufficient housing is 0.59%, and the management of old and dilapidated houses achieves good results. Housing conditions of residents continue to be improved. The management of urban dangerous old houses and the renovation of old neighborhoods should be strengthened in the future.

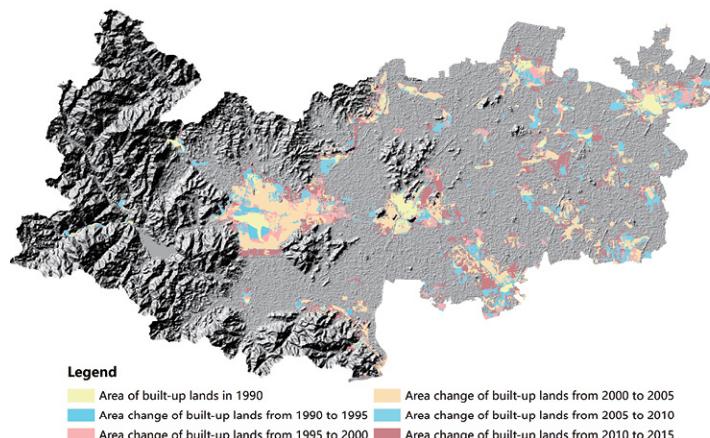


Fig. 2-26 Urban and Rural Construction Land and its Growth in Deqing

**Created a habitat environment suitable for living, working and travelling, with an urban green space rate of 38%.** Deqing has implemented "Beautiful Town" project by overlaying its ecological, regional and industrial advantages, so as to create characteristic towns that are suitable for living, working and travelling, including geospatial information town, piano town and Mogan Mountain tourism style town. In terms of the public cultural services, Deqing has developed the construction of stylistic facilities, built "five large group halls" including cultural hall, library, museum, sports center and Deqing Grand Theater, with other characteristic venues like Civic Ethics Museum. The area of public space per capita in urban built area is 8.63m<sup>2</sup>. The proportion of the population with convenient access to public transportation of Wukang Subdistrict is 84%, while the other subdistricts vary between 18% and 33%. The public transport convenience has big differences between urban and rural areas, thus, construction of public transport needs to be strengthened in rural areas.



Fig. 2-27 Comparison of the Dangerous Housing Before (left) and After Renovation (right)

**Improved the living environment of urban and rural residents, and ensured the residential security.** Deqing took the lead in the country in implementing an urban-rural environmental management integration model called "a broom ends all litter". The coverage rate of collection and harmless treatment for the domestic waste had achieved 100% in both urban and rural areas. The domestic waste classification and treatment in rural areas achieved full coverage, and the solid waste recovery rate reached 100%. Deqing launched the "Blue Sky Safeguard" action, making its annual average concentration of PM2.5 9.29 μg/m<sup>3</sup>/million people, and the proportion of heavy air pollution days continue to decrease, reaching 10.1% in 2017. Deqing has constructed meteorological disaster monitoring network covering the county and strengthened the management of hidden dangers caused by geological hazards, thereby fully preventing the public safety incidents. Further efforts are supposed to be made to construct sponge city and enhance the county's resilience to disasters.

## Summary

Deqing has focused on building an international landscape idyllic city "suitable for living, working and travelling", by improving living conditions, optimizing the livable environment and ensuring the residential security.

**12 RESPONSIBLE CONSUMPTION AND PRODUCTION**

**[ Goal 12 ]**
**Ensure sustainable consumption and production patterns**
**Connotations and Indicators**

SDG 12 aims to promote the efficient use of resources and energy, spread sustainable consumption and production patterns and mitigate the environmental impact of economic life. Three categories of objectives are highlighted, including the efficient use of resources and energy, the implementation of pollution prevention and control, and the promotion of green consumption.

- ◆ "Efficient utilization" focuses on material and energy consumption, including energy consumption of GDP, water consumption of GDP and output of industrial land. Indicators 12.2.2.a, 12.2.2.b and 12.2.2.c are used.
- ◆ "Pollution prevention" emphasizes the control and reduction of hazardous waste and pollution, including the yield, utilization and disposal rate of hazardous waste, utilization rate of straw, livestock and poultry manure, solid waste disposal and the audit of clean production. Indicators used are 12.4.2, 12.5.1 and 12.6.1.
- ◆ "Green consumption" stresses on the government's green procurement, specifically referring to the ratio of the government's green procurement. Indicator 12.7.1 is used.

**Quantification**

SDG 12 includes 5 indicators. All the 5 indicators are calculated by statistical data.

Table 2–12 Quantified Indicators for SDG 12

Content	Indicators	Quantitative result	Evaluation reference
Efficient utilization	12.2.2 Resource consumption		
	12.2.2.a Rate of change measured in terms of primary energy and GDP	-3.6%	
	12.2.2.b Water consumption per unit of regional GDP	75.96 m <sup>3</sup> /10,000CNY	
	12.2.2.c Industrial added value of industrial land above designated size	11.7285 million CNY/ ha	
Pollution prevention	12.4.2 Generation and treatment of hazardous wastes		
	12.4.2.a Hazardous waste generated per capita	0.10 tons / person	IV
	12.4.2.b Utilization ratio of hazardous waste	50.35%	
	12.4.2.c Disposal ratio of hazardous waste	48.07%	
Green consumption	12.5.1 Utilization rate of waste		
	12.5.1.a Utilization ratio of straw	94%	82%
	12.5.1.b Comprehensive utilization ratio of livestock and poultry manure	100%	100% IV
	12.5.1.c Disposal ratio of common industrial solid waste	99.6%	
Green consumption	12.6.1 Ratio of enterprises passed the mandatory cleaner production audit	R 100%	V
	12.7.1 Ratio of government green procurement	R 92.45%,100%**	V

## Implementation

**Having built an efficient and economical resource utilization system, the consumption of energy and water continues to decline.** Deqing has vigorously enhanced the efficiency of the production with the goals to conserve energy and reduce consumption. In addition to eliminating the backward capacity in energy-intensive industries with heavy pollution, Deqing has introduced high-quality and efficient projects to promote the transformation and upgrading of enterprises. Energy and water consumption continue to decline, with the annual average energy consumption of GDP reduced by 4.8% (2012-2016). In 2016, water consumption of GDP dropped to  $75.96 \text{ m}^3/10,000 \text{ yuan}$  (\$1,538). Deqing County continues to improve resource utilization, and future efforts need to be made to deepen the construction of efficient and economical resource utilization system.

**Enhanced the supervision of pollution prevention and control, strengthened the control of solid and hazardous waste, and reduced pollution effectively.** Deqing has been maintaining zero tolerance for environmental violations and strengthening the regulation for the whole life cycle of hazardous waste. In 2016, the annual safe disposal rate of hazardous waste was over 98%. Deqing is vigorously carrying out pollution remediation in agriculture and aquaculture, and forbidding the burning of straw. The comprehensive utilization rate of straw reached 94% in 2016, and that of livestock and poultry's manure in large-scale farms was 100%. The effectiveness of pollution prevention and control work in Deqing is evident, and the supervision and enforcement need to be further strengthened continuously.

**Vigorously advocated green office, green shopping and green transportation by promoting green consumption mode.** Deqing continuously strengthens the green procurement of the government. Through formulating the green procurement list, strictly enforcing the mandatory or priority procurement of energy-saving and environmental-friendly products system, Deqing has effectively built a conservation-oriented government, with a whole 100% ratio of green procurement in 2017. Deqing has advocated green consumption and travel, encouraged the use of water-saving appliances, energy-saving lamps and electrical appliances, as well as green building materials like coatings and furniture with Green Logo.



Fig. 2-28 Thermal Energy Saving Technical Transformation Project of Han Ye Company in Deqing



Fig. 2-29 Comprehensive Utilization of Straw in Deqing

## Summary

Deqing has actively constructed an efficient and economical resource utilization system, enhanced the supervision of pollution prevention and control, strengthened the control of solid and hazardous waste and promoted green consumption mode. All these have effectively facilitated sustainable consumption and production patterns. In terms of the pollution control, Deqing still needs to control the generation of harmful waste, especially hazardous waste.

## 13 CLIMATE ACTION



### [ Goal 13 ]

## Take urgent action to combat climate change and its impacts

### Connotation and Indicators

Global warming, and frequent natural disasters caused by climate change pose a serious threat to humans. Reducing the impact of climate change requires positive action by regions all over the world. SDG 13 can be interpreted in two aspects: disaster resilience, education and training in addressing climate change.

- ◆ "Disaster resilience" focuses on the analysis of disaster prevention and mitigation capacity, including the number of deaths/disappearances/influence due to disasters, the coverage of meteorological stations and emergency shelters. They are quantified using indicators 13.1.1 and 13.1.3.
- ◆ "Education and training in addressing climate change" mainly analyzes the education and training responding to climate change, including the education/popularization of disaster prevention and mitigation, and the reasonableness setting of meteorological staff. Indicators 13.3.1 and 13.3.2 are used for measuring the awareness popularization of climate change by using.

### Quantification

SDG 13 includes 4 indicators. All 4 indicators are measured by statistical data.

Table 2–13 Quantified Indicators for SDG 13

Content	Indicators	Quantitative result	Evaluation reference
Capabilities of disaster prevention and mitigation	13.1.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population	A Deaths: 0 Missing: 0 Directly affected: 820	
	13.1.3 Basic capabilities of monitoring, early warning and disaster prevention and mitigation		
	13.1.3.a Proportion of townships with weather stations	100%**	
	13.1.3.b Monitoring coverage ratio of a weather station	100%**	
	13.1.3.c Public coverage ratio of meteorological warning information	95% above**	R 100%
	13.1.3.d Proportion of townships with emergency shelters	100%**	V
	13.1.3.e Proportion of administrative villages with emergency shelters	100%**	
Education and training on climate change	13.1.3.f Proportion of townships with relief supplies	100%**	
	13.1.3.g Proportion of administrative villages with relief supplies	100%**	
	13.3.1 Proportion of schools having incorporated mitigation, adaptation, impact reduction, and warning content into the curriculums	R 100%**	100% V

Content	Indicators	Quantitative result	Evaluation reference
13.3.2 Proportion of townships with meteorological staff and proportion of meteorological staff involved in science popularization training on disaster prevention and reduction	R 100% townships with meteorological staff ** 100% staff involved in popular science training **	100% townships with meteorological staff ** 100% staff involved in popular science training **	V

## Implementation

**Strengthen both the hardware and software infrastructure for meteorological disaster monitoring and warning, and realize full coverage of disaster warning and disaster prevention.** A number of supporting policies have been issued, and 27 meteorological monitoring stations have been built, covering 100% of the whole region, and the public coverage rate of warning information has reached more than 95%. Towns and administrative villages are well equipped with emergency shelters, emergency relief supplies with a 100% coverage. In recent years, the number of people affected by disasters has declined year by year, with no deaths or disappearances. Deqing has a strong ability in meteorological disaster monitoring, but there is still room for further improvement in the public coverage rate of meteorological disaster warning information.



Fig. 2-30 Distribution of Disaster Avoidance and Resettlement Sites in Deqing

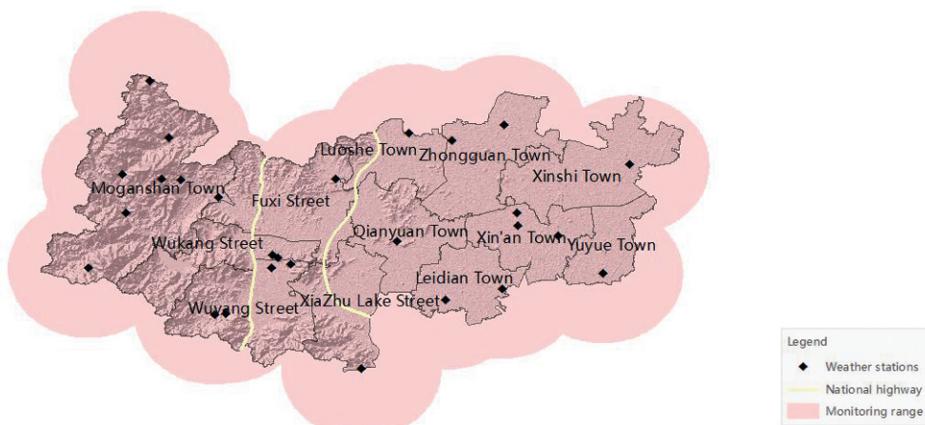


Fig. 2-31 Distribution of Meteorological Monitoring Stations in Deqing

**Significantly increased the popularization rate of knowledge to cope with meteorological disasters by conducting various types of popular training.** A system of mobile safety education platform is released to urge parents and children of all kindergartens, elementary, middle and high schools in Deqing to learn disaster prevention and reduction safety courses together. By carrying out meteorological dissemination, the rate of the course of meteorological disaster reduction and prevention in 2016 was as high as 100%. Each town (subdistrict) is equipped with meteorological staff, who is responsible for the dissemination of meteorological information and knowledge, to raise the awareness of the rural people. In the future, Deqing still needs to encourage and guide social resources and forces to actively participate in disaster prevention and reduction.



Fig. 2-32 Popularization of Meteorological Disaster Knowledge at Farmland in Deqing



Fig. 2-33 Popularization of Meteorological Disaster Knowledge in a Deqing's Primary School

## Summary

Deqing vigorously strengthens the construction of hardware and software infrastructure for meteorological disaster monitoring and early warning, constructs a relatively perfect system of disaster early warning and disaster prevention and reduction, carries out popular science training for meteorological disasters, and greatly improved public awareness and the ability of disaster prevention and mitigation. It is proved that Deqing has a strong ability to cope with climate change.

**15** LIFE ON LAND**[ Goal 15 ]**

**Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss**

**Connotation and Indicator**

Strengthening the management of forest resource, combating land degradation and desertification, and protecting biodiversity are three important means of protecting, restoring and promoting the sustainable use of terrestrial ecosystems. SDG 15 contains three specific objectives: tending of the forest, maintenance of land production, and protection of important sites of biodiversity.

- ◆ "Tending of the forest" focuses on the analysis of forest management and forest cultivation by using the indicators 15.1.1, 15.2.1, and 15.4.2, including forest area, forest protection, artificial afforestation, and vegetation cover.
- ◆ "Maintenance of land production" focuses on the maintenance of land productivity, including the productivity of woodlands, grasslands, and arable land, using indicator 15.3.1.
- ◆ "Protection of important sites of biodiversity" focuses on key site protection, including the proportion of important sites for biodiversity that are covered by protected areas, and the cost of environmental protection. Indicators used are 15.1.2, 15.4.1 and 15.a.1.

**Quantification**

SDG 15 includes 12 indicators. Indicators 15.2.1.c, 15.3.1.b, and 15.a.1 are quantified by statistical data, while the remaining indicators are quantified by geospatial information.

Table 2-14 Quantified Indicators for SDG 15

Content	Indicators	Quantitative result	Evaluation reference	
Tending of the forest	15.1.1 Forest area as a proportion of total land area	A 42.83%	23.04%	II
	15.2.1 Progress towards sustainable forest management			
	15.2.1.a Rate of change in forest area	-0.42% E	Green: ≤3% Yellow: 3%<x≤4.5% Orange: 4.5%<x≤6% Red: >6%	I
	15.2.1.b Proportion of forest area in protected area	76.90%		
	15.2.1.c Rate of change in area of afforestation	1.56%		
	15.4.2 Mountain vegetation cover	R 80.5%**		

Content	Indicators	Quantitative result	Evaluation reference	
Maintenance of land production	15.3.1 Land degradation			
	15.3.1.a Rate of change in NPP of forestland and grassland	R 1.64%		
	15.3.1.b Rate of change in crop yield per unit area	1.08%	The rate of change is positive and continues to increase	IV
Protection of important sites of biodiversity	15.1.2 Proportion of important sites for biodiversity that are covered by protected areas	R 89.1%*	Green: $\geq 50\%$ Yellow: $50\% > x \geq 30\%$ Orange: $30\% > x \geq 10\%$ Red: $< 10\%$	I
	15.4.1 Proportion of important sites for mountain biodiversity that are covered by protected areas	R 96.3%*	49%	III
	15.a.1 Proportion of expenditures for environmental protection in government budgetary expenditures	R 2.93%	2.52%	IV

## Implementation

**The implementation of greening forestation projects created a green Deqing, with the forest coverage remaining stable at more than 40%.** Deqing successively implemented the precious colored forest, plain greening, serious of forest creation, forestry ecological Red Line protection compensation, and other nine key construction projects, and built ten beautiful rural landscape lines, such as the Moganshan Exotic Sightseeing Line. Through the implementation of forest disasters prevention and control, and resource management, Deqing's forest coverage rate reached at 43.46% in 2017. About 76-80% of the forests are classified into protected areas, and the vegetation coverage in mountainous areas is stable around 0.8. In the past five years, Deqing's artificial forestation has been increasing at an average annual rate of 2.4%, and it has won the honorary titles of Chinese national greening model county due to its outstanding achievements in forest cultivation.



Fig. 2-34 Forest Distribution in Deqing (2017)

**Deqing established the land improvement mechanism, and the land productivity remained stable.** Combined with the planning of towns and villages, the land remediation mechanism was established for the whole county, the structure of land use was adjusted, the quality of land use was improved and land degradation was prevented. Through these measures, the yield of grain crops in Deqing was stable at over 7000 kg/ha, which was higher than the Chinese national average. The net primary productivity of forest and grassland in the county continued to increase, and the average net primary productivity of forest and grassland increased by 3.42% in recent years. The quality of cultivated land is steadily improving, the capacity of vegetation ecosystem continues to increase, and the overall state of land productivity is sound. In addition, Deqing carried out reclamation and utilization of abandoned mining areas, separated the topsoil for "moving soil and cultivating fertilizer", which was used to cultivate high-quality paddy fields and improve the cultivated land quality.

**Deqing carried out species protection and effectively promoted the protection of important sites of biodiversity.** By actively carrying out the work of wildlife epidemic source disease monitoring, prevention and control, wildlife rescue management, and animal/plant protection publicity education. The crested ibis population has been growing steadily, with a total of 323, including 87 in the wild. By establishing the "id card" system of ancient trees, 644 ancient trees were effectively protected in the county. By drawing the red line area of natural ecology and the ecological environment protection area, Deqing's conservation area is up to 48.4% of the total area of the county. The proportion of important sites for biodiversity that are covered by protected areas is as high as 89.1%, and about 96.3% of important sites for mountain biodiversity that are covered by protected areas. All of these indicate that most of the regions with important ecological value in Deqing are in effective management and protection, and the stable development of biological resources and ecological capacity is effectively guaranteed.

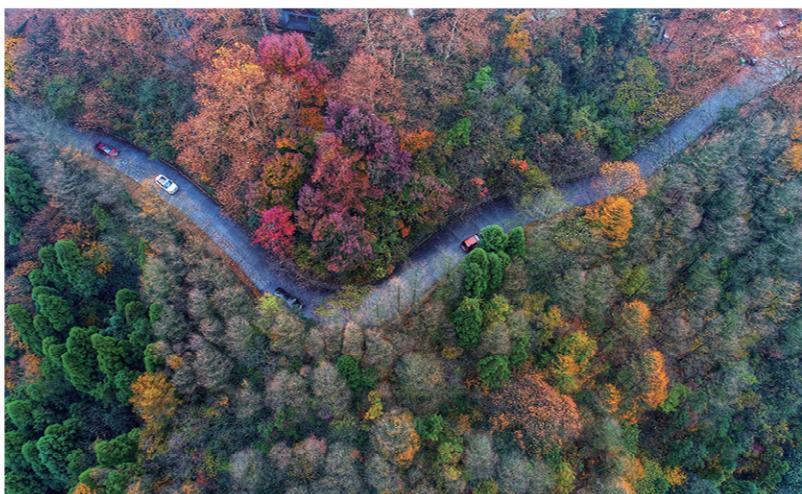


Fig. 2-35 "Colorful Forest" Project in Deqing

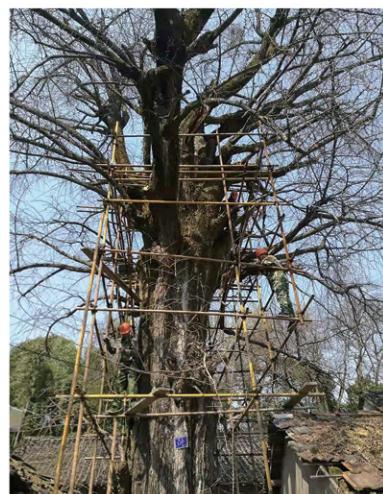


Fig. 2-36 Protecting Famous Ancient Trees in Deqing

## Summary

Deqing has carried out nine major forestation projects, established and implemented land consolidation and reclamation mechanism, and carried out species protection work focusing on breeding of crested ibis and protecting famous and ancient trees. Forest sustainability has been significantly enhanced, land productivity has remained stable, biodiversity has been effectively protected, and ecosystems have been functioning well.

**16 PEACE, JUSTICE AND STRONG INSTITUTIONS****[ Goal 16 ]**

**Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels**

**Connotation and Indicators**

SDG 16 aims to reduce crime and violent conflict, safeguard the rights and interests of individuals and create a harmonious and inclusive society, including three specific objectives: reduce crime and maintain public order, combating corruption, fiscal transparency, and judicial justice, guaranteeing human rights.

- ◆ "Reduce crime and maintain public order" refers to the suppression and reduction of all forms of crime, including intentional homicide, sexual violence, intentional injury, etc. Indicators 16.1.1 and 16.1.3 are used.
- ◆ "Combating corruption, fiscal transparency" focuses on the fight against corruption and the maintenance of financial transparency, including corruption of public officials, basic government expenditure, etc. Indicators sued are 16.5.1 and 16.6.1.
- ◆ "Judicial justice, guaranteeing human rights" aims at judicial justice, specifically analyzes whether criminal acts are punishable by law. Indicator 16.3.2 is used.

**Quantification**

SDG 16 includes 7 indicators, and all indicators are calculated with statistical data.

Table 2-15 Quantified Indicators for SDG 16

Content	Indicators	Quantitative result	Evaluation reference	
Reducing crime, maintaining public order	16.1.1 Number of victims of intentional homicide per 100,000 population	R 0.46	5.2-6.7	III
	16.1.3 Proportion of population subjected to physical, psychological or sexual violence in the previous 12 months			
	16.1.3.a Number of victims of sexual violence per 100,000 population	R 2.96		
	16.1.3.b Number of victims of intentional injury per 100,000 population	R 15.95		
	16.5.1 Number of persons who paid a bribe to a public official, or were asked for a bribe by public officials per 100,000 population	R 0.2	1.3	IV

Content	Indicators	Quantitative result	Evaluation reference
Combating corruption, fiscal transparency	16.6.1 Primary government expenditures as a proportion of original approved budget	A 99.67%* 98.26% 100.76%**	Aggregate expenditure outturn was between 95% and 105% of the approved aggregate budgeted expenditure in at least two of the last three years.  V
Judicial justice, guaranteeing human rights	16.3.2 Unsentenced detainees as the proportion of overall detainees	R 17.6%	31%  III

## Implementation

**Various crimes in Deqing is obviously reduced thanks to "peaceful Deqing" action.** Deqing firmly set up the concept of "peace by at ordinary times, target by measures, and share by co-building". Deqing has been strengthening the foundation by making great efforts to improve public security, public safety, and emergency disposal. At the same time, Deqing effectively solved the problems of the masses in the form of local mediation committees and peace talks, forming a social stability pattern of integration of departments and wide participation of the masses. In recent years, the number of crimes (including the criminal cases, the robbery case, the theft case, black evil forces, and other kinds of crimes) and the number of victims of all kinds of crimes has decreased. In 2017, the number of victims of intentional homicide was 0.45 per 100,000 population, which was far below the world average, and the number of victims of sexual violence/ intentional injury per 100,000 population also remained low. Deqing has been named "Safe County" in Zhejiang Province for 11 consecutive years until 2016.



Fig. 2-37 "Safety and Security" Publicity and Education Activities in Deqing



Fig. 2-38 "Safety & Security" Investigation in Deqing

**By building "incorruptible Deqing" and firmly opposed to corruption, Deqing has promoted the establishment of transparent and efficient government institutions.** With the goal of "incorruptible cadres and incorruptible government" and the core of regulating of power operation,

Deqing's government has strengthened supervision of public funds, public resources, and public assets, strived to create a transparent government with no restricted areas, full coverage and zero tolerance, and intensified efforts to punish corruption. In recent years, the occurrence rate of corruption cases in Deqing has been steadily reduced, and the number of bribery cases has remained low. The efficiency and transparency of government departments have been continuously improved, and the financial performance has been steadily improved. In the last five years (2012-2016), the proportion of primary government expenditures in the original approved budget was 99.53%, 104.4%, 99.69%, 99.67%, and 98.26%. The budget of fiscal expenditure is equal to the final accounts, and the government's fund management ability is effectively guaranteed.

**By implementing the "government by law" and deepening the reform of the judicial system, the efficiency of the execution of trials in Deqing has been improved steadily, and the basic human rights of detainees have been guaranteed.** Deqing focuses on law-based governance and law-based administration, promotes fair judicature, improves the quality and efficiency of judicial execution, and protects the lawful rights and interests of citizens. Since 2011, the unsentenced detainees as the proportion of overall detainees have been kept within 20%, which was lower than the world average (31%). The efficiency of dealing with the conviction and judgment of detainees has been steadily improved, the personal rights of detainees have been effectively guaranteed, and the judicial credibility has been further enhanced.

## Summary

Deqing adheres to "people-oriented", prevent and crack down on illegal crimes, and build a "safe Deqing". By resolutely preventing and combating corruption, Deqing creates an "incorruptible Deqing". Through deepening the reform of the judicial system, practice the "government by law". Through these measures, Deqing's social security was maintained, a transparent and efficient Deqing government was established, and Deqing's judicial justice was guaranteed.

## 17 PARTNERSHIPS FOR THE GOALS



### [ Goal 17 ]

## Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

### Connotation and Indicators

SDG 17 calls on multiple groups, such as governments, the private sector, and civil society to work together to build partnerships for the enabling environment for sustainable development. The goal encompasses three specific objectives: top-level design, partnerships, and capacity building.

- ◆ "Top-level design" emphasizes the continuity and consistency of regional sustainable development ideas and practices, including the coherence of government policies, mobilization of social enterprise participation, and cooperation of government, enterprises, individuals, and other multilateral to promote the partnership. Evidences and practical examples are collected and used for qualitative analysis.

- ◆ "Partnerships" focuses on inter-regional cooperation of capital, trade, science, and technology, including the situation of regional tax, foreign aid, foreign investment, import and export, the popularity of the internet, etc. Indicators used are 17.1.1, 17.2.1, 17.3.1, 17.8.1 and 17.11.1.

- ◆ "Capacity building" focuses on the construction of talents and data, including the sustainable construction of the talents and data platform. Evidences and practical examples are used for qualitative analysis.

### Quantification

SDG 17 has 5 indicators which are measured with statistical data.

Table 2-16 Quantified Indicators for SDG 17

Content	Indicators	Quantitative result	Evaluation reference
Financing, trade and technology cooperation	17.1.1 The Proportion of Regional taxation to the GDP	R 16.21%	green: $\geq 25\%$ yellow: $25\% > x \geq 20\%$ orange: $20\% > x \geq 15\%$ red: $< 15\%$
	17.2.1 The Proportion of Aid to Other Regions to the GDP	R 0.04%	
	17.3.1 Foreign Investment	S Contractual foreign investment is about 420 million USD** Actual foreign investment is about 180 million USD**	
	17.8.1 The Proportion of Internet Users to the Total Number of Households	R 107.54%*	50.3%*
	17.11.1 Total exports as a percentage of GDP	S 28.1%	

## Implementation

**By emphasizing the continuity of administration and system, Deqing kept the consistency of top-level design. "One blueprint for different tenures"** is Deqing's principle of government management. The policy of "linking Shanghai and Hangzhou" has been carried out for 15 years since 2003, although the replacement of leading cadres has happened halfway, the development idea is consistent. The leading role of top-level design for the sustainable development of Deqing has been highlighted. It is necessary to deepen the guiding role of top-level design for the sustainable development of Deqing in the future.

**Deqing took part actively in the "Belt and Road" initiative and has built up wide range of cooperative partnerships.** Focusing on capital cooperation, trade cooperation, and technical cooperation, Deqing has actively explored the investment market of countries along the "Belt and Road". At present, Deqing has established cooperative partnerships with 9 countries along the "Belt and Road", foreign trade covers 162 countries and regions on five continents, overseas investment has covered 34 countries and regions, established friendly relations with the cities of Lieksa (Finland), Walls (Spain), and other foreign cities. In 2016, Deqing exported 3.26 billion yuan (501 million USdollors ) to the "Belt and Road" countries. The United Nations First Geospatial Information Congress in Deqing will become another important platform for developing Deqing's international partnerships. Gathering leading enterprises of geospatial information, planning open cooperation platform, and deepening international industrial cooperation are all important opportunities for the construction of future partnerships of Deqing.

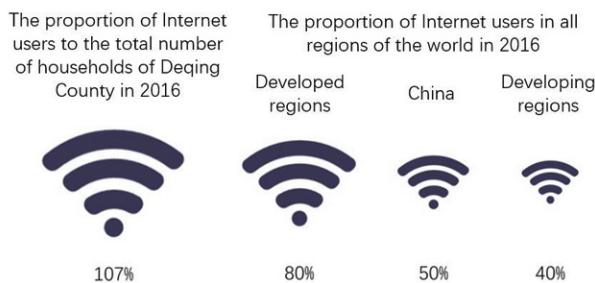


Fig. 2-39 Deqing's Number of Internet Users as a Proportion of Number of Resident Households and World Data Comparison Chart

**By gathering talents teams and geospatial information platforms, Deqing further deepened the capacity building.** Focusing on the implementation capacity of government management, Deqing actively carried out capacity building/training activities in various functional departments on different themes and introduced high-end talents from home and abroad, the total amount of human resources reached 107,800. Deqing established a big data development center to provide data support for government decision-making and sustainable development. Deqing gave full play to the advantages

of the geographic information featured industries and the concentration of featured talents and accelerated the establishment of the national geographic information industrial park and international geographic information exchange and cooperation center, national geographic information technology innovation center and national geographic information big data industry center. The high-level talent team and all-around data platform have greatly improved the scientific effectiveness of the formulation and implementation of sustainable development policies in Deqing.



Fig. 2-40 Venue of United Nations Geographic Information Congress

## Summary

Deqing, with the development idea of "**One blueprint for different tenures**", promotes the construction of multi-party partnerships, cultivates and gathers the talents team, builds a data platform, improves the implementation means, and gathers various forces to jointly practice all-around sustainable development.

## Single goal assessment summary

Having a very good geographical environment and a long history of humanities, Deqing has actively implemented SDGs in recent years and achieved remarkable outcomes, under the guidance of green development concept and with the support of contemporary science and technology.

1. 68 of Deqing's 102 indicators have reached or are very close to the objectives of the United Nations 2030 SDGs, or have performed well in China and in the world (green), through a comparison with SDGs dashboards and China's "National Plan". It accounts for 86.1% of the 79 indicators that have comparable standards or ranking criteria. There are still gaps for 9 indicators, which need to be improved (yellow), accounting for 11.4%; 2 indicators are facing challenges (orange), accounting for 2.5%. No significant gaps can be observed among these Deqing's SDGs and that of the agenda 2030. However, there are 23 indicators that lacked reliable comparison criteria and could not be evaluated at this time.

2. Further quantitative and qualitative analysis shows that Deqing has basically fulfilled the requirements of eight SDGs of the agenda 2030, i.e., SDG 1, SDG 2, SDG 4, SDG 8, SDG 10, SDG 13, SDG 15, SDG 16. Six SDGs need to be improved, including SDG 3, SDG 5, SDG 6, SDG 7 and SDG 12. Two SDGs are facing challenges, including SDG 11 SDG 17. In summary, Deqing has well implemented the sixteen SDGs and there still spaces to improve.

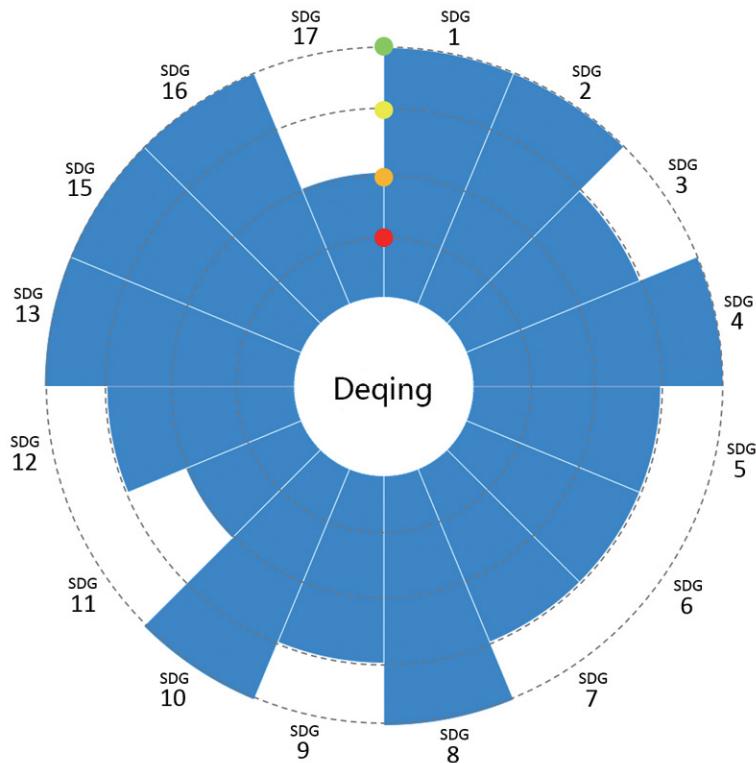


Fig. 2-41 Progress of SDGs in Deqing

## 3. SDGs Cluster Analysis

### 3.1 Economic Growth

The economic cluster consists of five SDGs, i.e, decent work and economic growth (SDG 8), industry-innovation and infrastructure (SDG 9) , reducing inequality to promote economically inclusive and sustainable growth (SDG 10) as well as eradicating hunger (SDG 2), and clean energy (SDG 7). The overall picture of the economic growth will be described firstly, and then the conditions for growth, growth trend and sustainable economic development will be analyzed. As shown by Fig 3-1, the necessary conditions for economic growth is related to the sustainable agriculture, sustainable industries, infrastructure, technological innovation, education and finance form. The economic growth trend can be reflected by economic growth rate and labor productivity, whereas the inherent requirement for achieving sustainable economic development rely heavily on income equality, equality of conditions as well as improving energy efficiency.

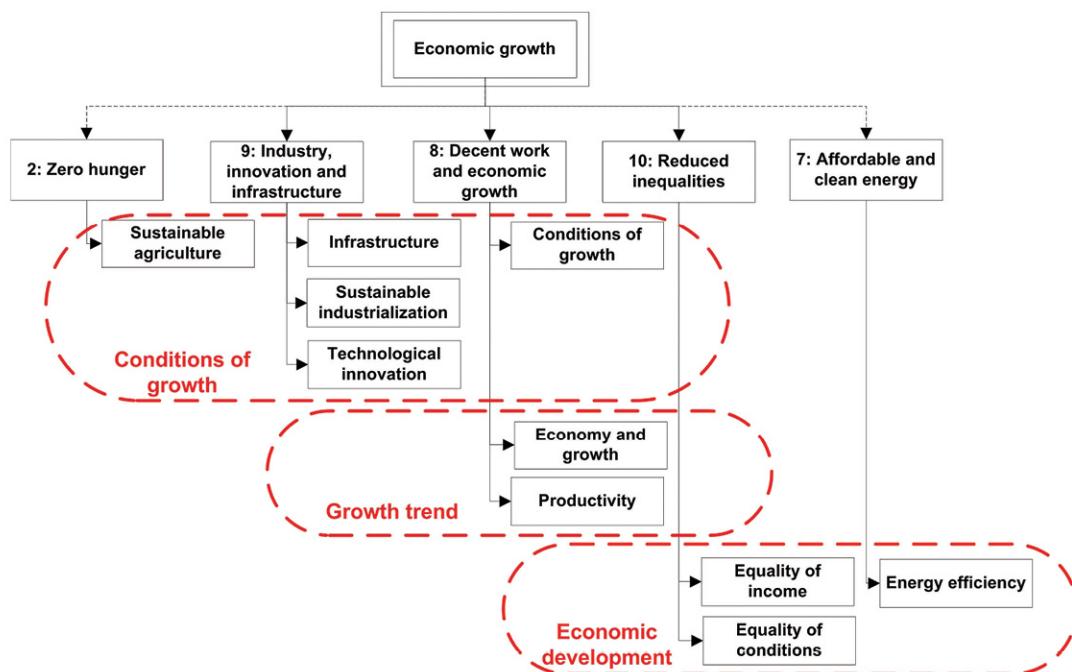


Fig. 3–1 Analysis Framework for Deqing's Economic SDGs cluster

#### Overall picture of economic growth

Deqing has made outstanding achievements in economic sustainable growth, comprehensive employment and decent work, urban and rural planning as well as innovation, which led to a sustainable industrialization. Good practices were made in developing a beautiful economy and upgrading the industrial structure. It can be seen from Table. 3-1 that the economic goals of Deqing are highly achieved,

the degree of coordination between the indicators is very high, and the coefficient of variation is very low. Among them, the variation co-efficiency of economic development conditions, economic trend and economic development are 0.086, 0, and 0.157 respectively, indicating that the coordination work is done better, especially in terms of economic growth, with a technology-intensive industrial structure. It will drive the continuous improvement of the overall level of economic development and the rapid growth of high economic quality. At the same time, through strengthening infrastructure construction, Deqing will actively develop sustainable agriculture and a beautiful economy. While protecting the ecology and environment, Deqing will achieve steady growth, provide more job opportunities, increase residents' income, and seek equality for everyone.

Table 3-1 Statistical Analysis of Deqing's Economic SDGs cluster

	$\mu$	$\sigma$	C.V.
Economic cluster	3.867	0.352	0.091
Conditions of growth	3.889	0.333	0.086
Growth trend	4.000	0.000	0.000
Economic development	3.667	0.577	0.157

## Conditions of growth

Deqing County lays the foundation for the upgrading, development and innovation of industrial structure by actively building infrastructure, developing education and developing ecological agriculture. At present, the road density is twice the national average road density, and the 500m service range of the all-season road covers all the residential areas of the county. Vocational education and adult education are rich and varied, and a large number of talents have received professional training of specific skills. Deqing has implemented the rice-fish symbiosis, rice-shrimp rotation, rice-soil symbiosis, under-forest breeding and other ecological species cultivation models. It has also put into effects the "three products" certification, which are green, organic, and pollution-free agricultural products. Deqing has promoted the continuous transformation of industrial structure into technology-intensive type, and has formed the "3+X" industrial system of equipment manufacturing, biomedicine, green home, and the strategic emerging industries, such as geographic information, general aviation, artificial intelligence, etc. The industrial system has changed from "manufacturing" to "quality creation" and "intellectual creation".

## Growth trend

In 2016, the actual per capita GDP of employees actually grew at an annual rate of 8.33%, and labor productivity growth trend was good. In 2017, the county achieved an annual regional GDP of 47.02 billion yuan(7.23 billion US dollars), an increase of 8.5%. Deqing's economy is dominated by the second

and third industries. In 2017, the proportion of the three industries was 4.7:51.9:43.4. The output value of leading industries such as equipment manufacturing, biomedicine and green households accounted for 70.2% of the scale industry. Strategic emerging industries and high-tech industries accounted for 38.9% and 50.2% of the scale of the industry respectively. The modern service industry represented by Mogan Mountain International Tourism Resort, inland Shipping Container Transport Deqing Port and Yangtze River Delta Financial Backstage Service Base has developed rapidly. Besides, tourism has grown rapidly as well. In 2017, the county received a total of 19.98 million domestic and foreign tourists, achieving a total tourism revenue of 21.5 billion yuan(3.3 billion US dollars), growing at the rate of 21.5% and 21.2%, respectively.

### Deqing Story 1 — "Story of Lucrative Leaf"

Why Deqing has achieved "three wins", economic growth, employment rise, and protection of the ecological environment at one time? Deqing Mogan Mountain's "Hill Station" (homestay hotel) has provided an answer.

Mogan Mountain in Deqing County has beautiful scenery and beautiful environment. The concentration of oxygen ions is up to 145,000/cm<sup>3</sup>, ranking the top few in the world. Mogan Mountain's high-quality ecological and beautiful scenery have attracted a large number of international leisure tourism projects to be launched in Mogan Mountain. Customers from South Africa, Britain, France and other countries have invested in more than 70 "Hill Station". They have helped developing experiential rural tourism, leisure tourism and eco-tourism, making Mogan Mountain one of the 45 most worthwhile places in the world by The New York Times.

"Hill Station" has become an important way for local farmers to increase their income. The rental price of farmers renting old houses is as high as 30,000–50,000 yuan/year(4,615–7,692 US dollars/year). Their average monthly income of villagers in "Hill Station" employment is over 4,000 yuan (615 US dollars). The local organic farms have become the major providers of the fresh vegetables, fruits and livestock for "Hill Station" business, which is another way for farmers to increase their income.

The increase in farmers' income has also boosted local economic growth. In 2017, 150 premium B&Bs as typified by "Hill Station" received 498,000 tourists, achieving a direct income



Fig. 3-2 "Naked Heart Castle" located in the Mogan Mountain part of Deqing County

of 580 million yuan (89.23 million US dollars). For instance, the tax in The Naked Heart Valley could reach 100,000 yuan (15,385 US dollars) per bed per year. The successful development of "Hill Station" has turned the local farmers into the managers of "Hill Station". The young laborers and highly educated talents have returned to Deqing to startup businesses on their own for the benefits of the wellness and wealth of local residents as well as the tourism development.

## Economic development

Deqing County has completely eliminated traditional coal-burning industries, vigorously promoted energy-saving measures to reduce emissions in key sectors, hence a new pattern of energy-saving production and consumption model were formed. The comprehensive energy consumption per unit of GDP fell by 30% in seven years. In terms of income equality and equality of conditions, Deqing has actively transformed and upgraded traditional industries, fostered and expanded emerging industries, innovated and developed ecological agriculture, gathered and upgraded modern service industries, thus providing a large number of high-quality jobs, creating a large number of job opportunities, promoting the return migration of rural labor force, and pay rises. In 2017, 21,000 new positions were offered, and as many as 6,906 laid-offs were reemployed. The urban registered unemployment rate was controlled at a low level of 2.6%. As Deqing actively promotes the integration of urban and rural areas, the urban-rural income ratio fell to 1.71, the urban and rural Engel coefficient is close to the same, and the urban-rural differences are shrinking.

## Deqing Story 2 — Peasant made Piano

Peasant, traditionally termed as a group people who works on land. The piano, on the contrary, is regarded as the "king of musical instruments" involving more than 300 processes and more than 8,000 accessories. How do these two concepts that seem to be out of bounds come together?

Before 1984, Luoshe town of Deqing County was still a typical agricultural town in the south of the Yangtze River. It was unthinkable to associate piano industry with peasants.



Fig. 3-3 Luoshe piano exhibition

However, an "accidental event" took place 30 years ago turned Luoshe town into the "hometown of China made piano".

In 1985, carpenter Wang Huilin started to get involved in the piano making crafts and succeeded in establishing Luoshe Piano Factory in his hometown. This was the first township owned enterprise engaging in piano production in the nation. Faced with the inefficiency of technology and talents, Wang Huilin hired four engineers from Shanghai Piano Factory and invited teachers from Nanjing Art College and Shanghai Conservatory of Music to Luoche to conduct audition checks. This had led to breeding a debate about talent return flow and therefore the "Sunday Engineer" model came into being. Later, Deqing County formed a relatively adequate piano industry chain and embarked the piano industry cluster development.

Nowadays, the piano manufacturing industry has become the core industry in Luoshe town. The total assets of the piano industry is worthy of 250 million yuan (38.46 million US dollars), the annual output value is about 500 million (76.92 million US dollars), and there are more than 3,000 employees in the piano industry, among whom more than 200 are professional and technicians. Their monthly average income is about 4,500–5,500 yuan (692–846 US dollars), which ranks top few among the local residents. The annual output of piano veneer production accounts for 1/3 of the total of national production, and piano production accounts for 1/6 of the national total. Luoshe made pianos have been widely exported to more than 20 countries and regions such as Europe and Southeast Asia countries.

## Vision

Deqing will give full play to the important role of geospatial information in leading the development of strategic emerging industries, further optimize the industrial structure, improve energy efficiency, develop a beautiful economy, and improve the well-being of residents.

### 3.2 Natural Beauty

The environmental cluster includes five goals: clean water and sanitation (SDG 6), affordable clean energy (SDG 7), responsible consumption and production (SDG 12), climate action (SDG 13) and life on land (SDG 15), with the aim of promoting ecological harmony. As illustrated by Fig. 3-4, resource utilization, protection of ecological environment and response to climate change are the three focuses of analysis. Among them, the rational use of various resources is related to water resources improvement, energy efficiency, efficient use and sustainable management of forests reflect; wading ecosystems protection, pollution prevention, green consumption, curbing land degradation and biodiversity conservation present the measures and effects of human protection of ecological environment; and the

popularity of disaster resilience and awareness of ideas are two important aspects of humans' regional response to climate change.

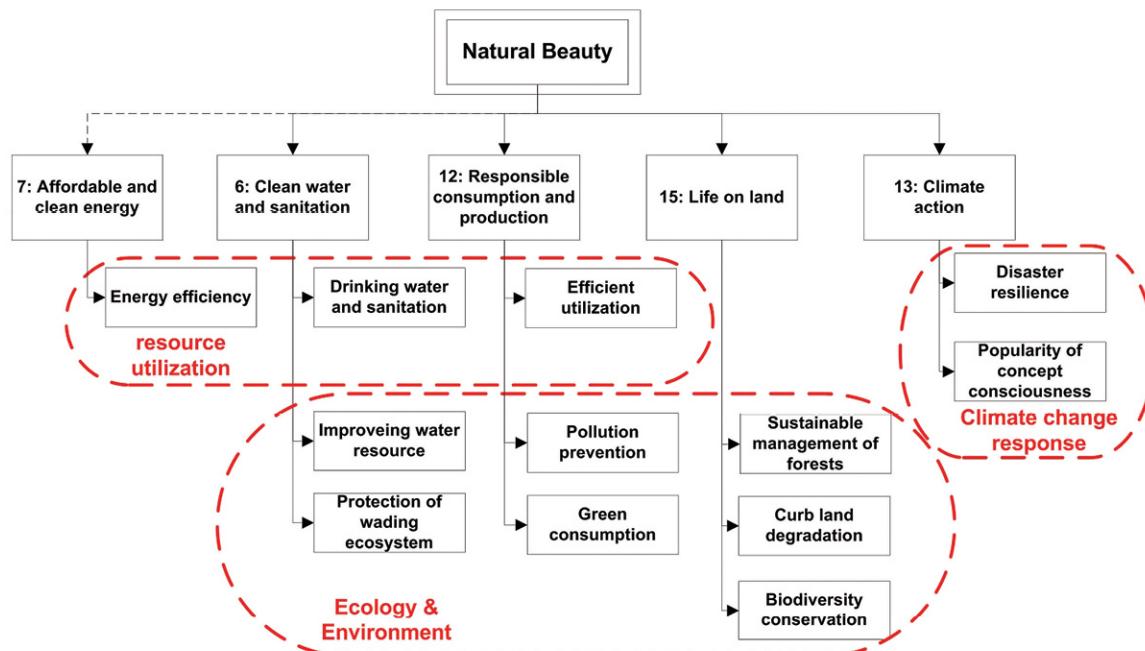


Fig. 3-4 Analysis Framework for Deqing's Environmental SDGs cluster

### Overall picture of natural beauty

In general, the "natural beauty" of Deqing has achieved good results, and has made remarkable achievements in the sustainable use of terrestrial ecosystems and actively responded to environmental goals such as climate change. Various eco-environment indicators have been rapidly improved in recent years to cope with climate change. The rate of change of action is high and most goals have met the requirements of SDGs.

Table 3-2 Statistical Analysis of Deqing's Environmental SDGs Cluster

	$\mu$	$\sigma$	C.V.
Environmental cluster	3.810	0.402	0.106
Resource utilization	3.667	0.577	0.157
Ecology & Environment	3.800	0.414	0.109
Climate change response	4.000	0.000	0.000

### Resource utilization

Water resource is one of the most important natural resources in Deqing County, and the total amount of water resources is relatively abundant. In terms of production water, the industry's water use efficiency has increased year by year, the sewage treatment system has been gradually improved, and

the quality of the water environment has gradually improved. In terms of domestic water use, water function zoning, water environment function zoning and environmental safety management of drinking water sources are strictly implemented. The urban and rural tap water penetration rates are 100% and 99.6% respectively, ensuring that Deqing residents enjoy safely managed drinking water services.

As far as energy resource utilization is concerned, its focus in recent years has been on energy conservation and consumption reduction and optimization of energy structure. The city has completely eliminated the traditional coal-burning method, reduced the production capacity of heavy-pollution and high-energy consumption industries, and introduced high-quality and high-efficiency projects to promote enterprise transformation and upgrading. The energy consumption of GDP is continuously decreasing, the utilization rate of water resources is continuously increasing, and the intensive use of land is continuously strengthening.

### Conservation of ecosystem

"Lucid waters and lush mountains are invaluable assets" is the basic concept and cornerstone of ecological environment protection. Forest management has been stabilized at more than 43% through forest management and afforestation. In terms of curbing land degradation, the county has established a land consolidation and reclamation mechanism, actively adjusted the land use structure, changed the wasteland into cultivated land, prevented land degradation, and improved land use efficiency. In terms of wildlife protection, we actively carried out monitoring and prevention of wild animal epidemic diseases, wildlife management and animal and plant protection publicity and education. The population of Zhu Huan (the Crested Ibis) has grown steadily from 7 to 323 in the past few years. Deqing has established an "ID card" system for ancient trees and effectively protect 644 ancient trees in the county. The natural ecological red line area and the ecological environment protection area are delineated. Most of the areas with important ecological value are in the effective management and protection of the protected areas, and the stable development of biological resources and ecological capacity has been effectively guaranteed.

Deqing used the "five-water joint governance" as a starting point for improving the water environment, and decisively shut down the "greenhouse turtles" and other polluting industries with ecological compensation mechanisms, and rectified the high-water consumption industries such as printing and dyeing, papermaking and chemical industry. Actively promote the "river and lake chief system", systematically control water pollution and long-term management and protection of rivers. The pressure on water resources has gradually improved, and the quality and efficiency of water resources have improved significantly.

In recent years, the environmental management has been strengthened, and a process-based treatment method for the comprehensive utilization and disposal of hazardous waste has been

proposed. The annual safe disposal rate of hazardous waste is over 98%. In terms of agricultural pollution, Deqing has will focus on building eco-agricultural demonstration counties, vigorously carry out agricultural aquaculture pollution remediation work, and completely banned straw burning. In 2017, the comprehensive utilization rate of straw is 95%, and the comprehensive utilization rate of livestock and poultry manure was 100%. Deqing has vigorously advocated green consumption of residents, using water-saving appliances, energy-saving lamps and energy-saving appliances, consumer environmental sign paints, environmental label furniture and other green building materials to promote green travel.

## Regional response to climate change

Deqing County actively responded to climate change, carried out a number of supporting policies, built 27 meteorological monitoring stations, and achieved 100% coverage of 12 towns. The public coverage rate of meteorological disaster warning information reached over 95%. Emergency shelters and emergency relief supplies are provided in all towns and administrative villages. During 2012-2017, the number of people affected by the disaster has declined year by year, and no one has died or disappeared due to natural disasters. Deqing regularly carries out science training on disaster prevention and mitigation, incorporates mitigation, adaptation, reduction of impact and early warning into school curriculum, and improves the awareness of disaster prevention and mitigation and meteorological disaster emergency response capabilities of meteorological information personnel and the general public.

### Deqing Story 3 — Home Coming of Zhu Huan

Zhejiang is the hometown of Zhu Huan (The Crested Ibis), a treasure trove of birds in China. Zhu Huan is an endangered bird in the world and demands for high standard living environment. However, the deterioration of the ecological environment has caused the habitat of Zhu Huan to be seriously damaged.

In the late 1950s, Zhejiang's last wild Zhu Huan disappeared. Zhu Huan disappeared, and Deqing people felt deeply sorry for Zhu Huan in their heart.

In order to appeal to Zhu Huan to "come home", it is necessary to rectify the pollution and protect the ecological environment. In order to improve the ecological environment, Deqing County has



Fig. 3-5 Zhu Huan's Main habitat – Xiaozhu Lake National Wetland Park

actively carried out the construction of beautiful pastoral. As of 2017, the county has established 1,720 rural domestic sewage treatment terminals, covering 99.25% of administrative villages; in the treatment of aquaculture wastewater, 1522 breeding tail water treatment stations have been established to achieve basic coverage of farm tail water treatment and to ensure fisheries. At the same time of breeding benefits, Deqing eliminated the pollution of tail water to the water environment; in the agricultural non-point source pollution treatment, Deqing upgraded the aquaculture industry, implemented the "beautiful pasture" project, and adjusted the industrial structure of the polluted farms to achieve 100% zero emission and 100% resource utilization. In the management of rivers, the "river chief system" is comprehensively implemented to control river pollution in the county. In 2017, all of the major monitored river water quality reached the standard.

The collection and analysis of geospatial information data records the process and achievements of the improvement of the ecological environment in Xiazhu Lake. Xiazhu Lake is the largest wetland in the south of the Yangtze River. It covers an area of  $10\text{km}^2$  and has a main lake of  $3.410\text{km}^2$ . Nearly 400 species of wild animals have inhabited and proliferated here, which marks itself as a veritable "wildlife zoo". In recent years, Deqing County has focused on the governance and improvement of wading ecosystems, wetland water quality, water source assurance rate, soil heavy metal content, soil pH, soil moisture content, biodiversity, wildlife habitat, wetland area change rate, land use intensity. The 10 indicators such as population density have been comprehensively improved, and the wetland ecological health status is good. The improvement of the wetland environment provides a good space for the survival of the national first-class protected animal Zhu Huan.

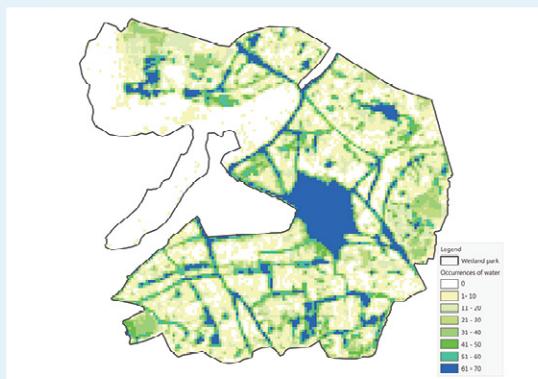


Fig.3-6-a Water evolution of Xiazhu Lake in the last 35 years

Water body change from 1984–2017 derived from Landsat images— spatial range change of water related ecosystem (an index in 6.6.1.d).

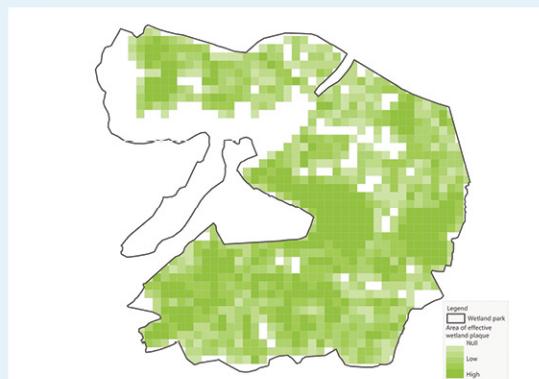


Fig.3-6-b Effective wetland patches area of Xiazhu Lake

Used for standardized wildlife habitat index—area of effective wetland patches (an index in 6.6.1.d).

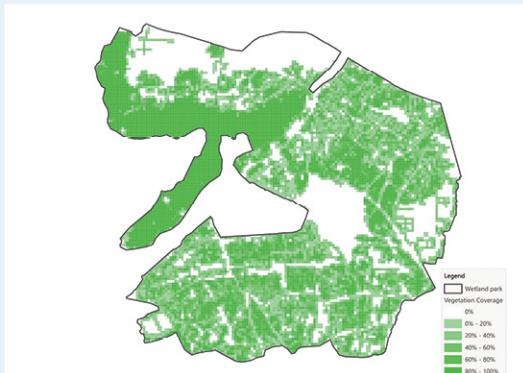


Fig.3-6-c Vegetation coverage ratio of Xiazhu Lake

Used for evaluating the standardized wildlife habitat index in the typical wetland health index 6.6.1.d.

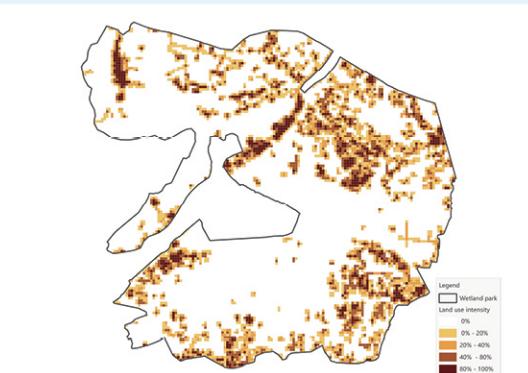


Fig.3-6-d Land use intensity of Xiazhu Lake

Used to evaluate the standardized land use intensity index in the typical wetland health index 6.6.1.d.

Owing to the improved ecological environment, Deqing County won the approval to undertake the "The Project of Introducing and Releasing of Artificial Breeding Zhu Huan" in 2008. 10 Zhu Huan was brought to Deqing. After careful man-aided breeding and cultivation, in April 2009, the first baby Zhu Huan was born in Deqing. In November 2014, 33 Zhu Huan were successfully released into the Xiazhu Lake. At present, the total number of Zhu Huan has reached 323. The long-awaited Zhu Huan eventually has come home and settled in Deqing.



Fig. 3-7 Zhu Huan Home-coming

## Vision

Comparatively speaking, the degree of coordination of the various indicators within the environmental cluster needs to be improved. The coefficient of variation in the field of resource utilization is 0.157, and clean water supply is fully covered. However, there is a gap in the intensity of energy use, which requires constant energy conservation and consumption reduction. The coefficient of variation in the field of ecological environmental protection is 0.109. In the process of rapid industrialization, as the industrial structure transformation and upgrading and economic growth mode are still in the process of continuous adjustment and optimization, the amount of hazardous waste generation needs further reduction, and the comprehensive disposal rate still needs to be further improved. At the same time, although Deqing County is rich in freshwater resources, the rapid increase in the load of freshwater resources brought about by rapid industrialization and urbanization still requires continuous improvement of water resource utilization.

### 3.3 Social harmony

The social SDGs cluster aims to build a harmonious and inclusive society and involves 7 goals, including poverty eradication (SDG1), hunger eradication (SDG2), health and well-being (SDG3), quality of education (SDG4), gender equality (SDG5), sustainable cities and communities (SDG11), and peaceful, just and strong institutions (16). Besides, there are 4 goals having linkage with the social cluster but have less strong contribution than the former 7 goals, including clean water and sanitation (SDG6), affordable and clean energy (SDG7), decent work and economic growth (SDG8) and reduced inequalities (SDG10). Using Maslow's theory of demand hierarchy, the connotation can be summed up as three aspects: the survival needs, the security needs and development needs.

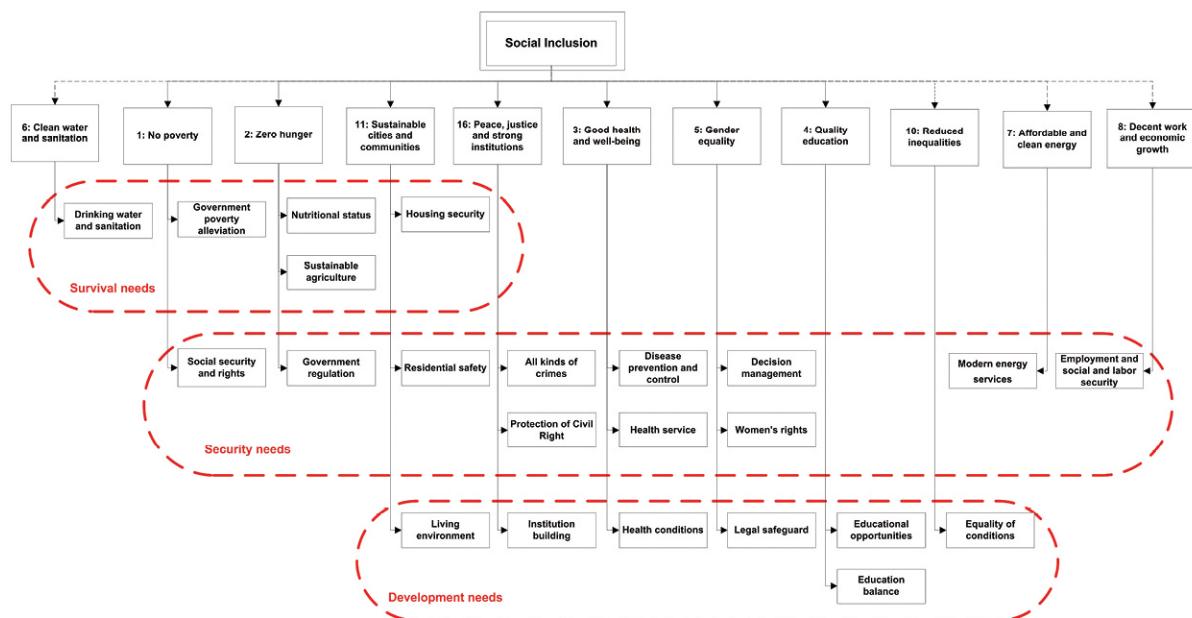


Fig. 3-8 Analysis Framework for Deqing's Social SDGs cluster

#### Overall picture of social harmony

Deqing has achieved remarkable results in eradicating poverty, achieving the goal of zero hunger, developing quality education and creating social goals such as peace and inclusion, and has created experience in social governance, human development security, and so on. As far as comprehensive evaluation is concerned, the overall coordination degree of Deqing's social SDGs is higher, the variable coefficient is only 0.102, but because the social field is extensive, the coordination degree of each index is slightly weaker than the economic SDGs. In the three progressive fields of survival needs, security needs and development needs, the coordination degree of social development of Deqing is characterized by increasing, the variable coefficient is 0, 0.098 and 0.38 respectively, which is in full accord with the hierarchical law of demand of human development.

Table 3-3 Statistical Analysis of Deqing's social SDGs Cluster

	$\mu$	$\sigma$	C.V.
Social cluster	3.872	0.397	0.102
Survival needs	4.000	0.000	0.000
Security needs	3.842	0.375	0.098
Development needs	3.824	0.529	0.138

## Survival needs

Over the years, Deqing has adopted kinds of plans to help the vulnerable groups to improve the nutritional status of citizens and housing security, to provide safe drinking water, to develop sustainable agriculture, etc. The basic survival needs of food, water, housing, basic livelihood security indicators have already met the requirements of the United Nations SDGs. At present, Deqing has achieved zero hunger and poverty eradication, the government has increased its funding for poverty reduction for vulnerable groups. The relatively living cost for the poor is 20.5 yuan/day (3.15 \$/day), much higher than the international (1.9 \$/day) and China (1.25 \$/day) of the poverty line. The dangerous old houses were renovated and the residence houses are to be improved for the better. Urban and rural areas are well integrated, and urban and rural living standard gap is becoming very small. In 2016, the urban and rural daily living costs are 127 yuan (18.27\$/day) and 74 yuan(10.64 \$/day) respectively. The food consumption per capita of urban and rural areas are 8374 yuan/year (1,204.38\$/day) and 4,864 yuan/year (699.56 \$/day) respectively, and the Engel coefficient between 25% and 30%, which shows that Deqing residents are staying at comparatively rich living level. Urban and rural tap water penetration reached 100% and 99.6% respectively. The urban-rural income ratio reduced to 1.69 in 2017.

## Security needs

Security mainly includes personal safety, settlement security, health protection, resource ownership, job security, and fair enjoyment of basic social security. Deqing County has good public security, and all kinds of vicious cases are far below the world average. There are fewer natural disasters, less dangerous buildings, higher garbage disposal rate and 100% coverage of the county's electric power service, and the safety of residential areas is effectively guaranteed. In terms of health protection, all types of health institutions have good infrastructure and balanced spatial distribution. The staff members of various medical institutions are reasonably configured to provide good health protection services for all the residents of the county. Deqing promotes employment through development, continuously strengthens vocational skills training, creates a large number of employment opportunities, reduces unemployment, and urges everyone to obtain decent employment. In 2017, the urban registered unemployment rate was controlled at a low level of 2.46%. In terms of basic social security, the social security system has

been actively improved. The population benefiting from one or more cash-welfare social security schemes is close to 100%, and the number of people participating in social insurance such as pension, medical care, unemployment, maternity and work-related injuries has increased year by year.

### Deqing Story 4—"The fabulous school bus"

Every morning, school kids from every village of Deqing county take yellow school buses in batches and start their school day. Deqing county has purchased 96 school buses since December 2009. Each day as many as 6,000 primary and secondary school kids under the age of 12 commute to and from school safely and comfortably. Meanwhile, Deqing also completed the construction of the safety facilities for school bus operation lines. As many as 410 standardized school bus stations and 171 bus shelters were built. The 14,055 meters long safety fences for the sections near waters and cliffs were installed. This has ensured the full coverage of the standardization, convenience and safety of school bus across the county.



Fig. 3-9-a The Interior of the Rural School Bus



Fig. 3-9-b The Exterior of Rural School Buses

### Development needs

Development needs are the highest level above all, which include appropriate living environment, health, effective and transparent institutions, educational opportunities, security, and government regulation and control. Deqing County integrates ecological, location and industrial advantages, and created a number of towns with distinctiveness, such as geospatial information town and piano town. These towns have become the most suitable places for living, working and leisure. The per capita income has reached a well-to-do level, but the residents' physical health conditions still need to be further cared for. Education is an important component to guarantee the all-round development of the local residents. The gross enrollment rate of compulsory education in Deqing has reached more than 99%, and the gross enrollment rate in high school has exceeded 95%. The education facilities have fully covered the county, and educational resources are reasonably allocated according to the population density, basically achieving balanced education and developing towards higher quality education.

In terms of transparent institutions and legal system, Deqing local government at all levels have improved the mechanism innovation to guarantee the anti-corruption system. Deqing also established and improved the anti-corruption supervision mechanism, and punished any act of corruption with zero-tolerance attitude. In terms of the public participation in social governance, the consultation platform for the rural "consultant committee" was also established to further improve the efficiency of social governance.

### Deqing Story 5 — "Consultant Committee"

The "Consultant Committee" (Xiangxian Committee) is a rural intellectual consultation platform in Deqing County, which can effectively supplement and improve rural social governance.

As Deqing residents have become more aware of their citizen rights and the importance of legal justice, the relationship between rural social interests and private interests have become increasingly complex. Traditional neighborhood conflicts such as homestead disputes and mountain forest contract disputes have more often occurred than before. New problems such as illegal construction and sewage discharge have emerged. The village self-governing committee often has far less professional personals and resources to deal with and solve these problems. Contradictions cannot be effectively resolved.

In order to promote rural social governance, Deqing has established the "Consultant Committee", including the highly respected elders and local elites who are doing business outside, and those who invest local industries. The responsibilities of "Consultant Committee" are consisted of negotiating and solving the conflicts of various problems in rural areas, as well as advising on decision-making for rural major affairs of development. Under the active promotion of the "Consultant Committee", some villages in Deqing County have set up a consultant service team. It has become apparently common consensus that the consultants are excel at dealing with the communal affairs and managing local business, who do good deeds and strive for virtues.



Fig. 3-10 Consultant Committee of Dongheng Village, Deqing County

## Vision

There are indicators in the social field that remains weak. Further measures should be made to reduce the incidence rate of diseases such as tuberculosis, to further improve the health condition of the entire population, and to reduce the energy consumption per unit of GDP so as to ensure a low-

carbon society. Deqing is in urgent need to improve the construction and accessibility of urban public transport facilities to promote the green travel concepts.

### 3.4 Summary

According to the analysis of the overall development level and coordination among the three economy, environment and society clusters in Deqing, the standard deviation and coefficient of variation of different clusters are small. This indicates that the stability of the three clusters and the overall system of sustainable development is relatively high, the clusters of economy, environment and society are harmonious at a higher level. Among them, the economic subsystem has the highest degree of stability and coordination. From the perspective of sustainable development, the achievements in the economic field are the most significant. The stability and coordination of environmental subsystems and social subsystems are slightly insufficient. There are still urgent needs to further reduce industrial emission, energy consumption and material consumption, and improve public transportation convenience.

## 4. Conclusion

In order to elaborate and demonstrate the way of reviewing and monitoring the implementation of 2030 agenda with geospatial and statistical information, a pilot project was conducted and completed in Deqing, the venue of the United Nations first World Geospatial Information Congress, for a comprehensive measurement of progress towards 2030 SDGs. Three major outputs were obtained from this pilot project: 1) a data driven and evidence-based approach for comprehensive measurement and analysis of a region's progress towards SDGs; 2) a report about Deqing's progress towards 2030 SDGs (2017); 3) an internet-based SDGs Knowledge portal (<http://47.99.207.114/deqing/>, [www.deqing-sdgs.net](http://www.deqing-sdgs.net)) for online information access and knowledge sharing. In order to facilitate further discussions, the term 'China (Deqing) SDG Profile' is used for naming these outputs. It will enable the understanding of two basic issues, i.e, how to realize a comprehensive assessment of a region's progress towards SDGs and how far the region (like Deqing) is from 2030 SDGs?

### 4.1 A data driven and evidence–based approach for comprehensive assessment

A comprehensive assessment of the implementation of SDGs in a region depends critically on the selection of appropriate indicators which can cover its major SDGs and have available and reliable data (both statistical and geospatial). First of all, the United Nations Global SDGs Indicator framework needs to be retailedored according to the regional characteristics, geographical scale, and development priorities. This is based on an in-depth analysis of the connotation of United Nations SDGs and Global SDGs Indicator framework, as well as the review of local situation and practices. Taking the case of Deqing as example, a set of 102 indicators was selected and 47 indicators were adopted directly from the global indicator framework (labeled as A). 6 indicators were the results of the extension (labeled as E), 42 indicators were revised (labeled as R) and 7 indicators are substitutes (labeled as S).

Tracking progress towards SDGs with a geographic location perspective is another important ingredient for a comprehensive regional assessment. Multi-type and multi-scale geospatial data are collected along with the statistical data. Both statistical and geospatial data are subject to a number of pre-processing and quality verification. For instance, geospatial disaggregation and aggregation are performed for population and road network data.

With the selected indicators and ready-to-use data, three different kinds of methods are applied to calculate the indicator. One is to calculate the indicators directly from statistical data, and the second is to derive or extract the indicators directly from geographical data (including remote sensed imagery). The third one is based on the geo-computing with both statistical and geographic information. For Deqing's 102 indicators, 85 were quantified using statistical data; 10 indicators were derived

from geospatial data, mostly related to environmental and social services, spatial accessibility; and 7 indicators were calculated by combining statistical and geospatial data.

With the help of quantified indicators and multi-type facts (data and local practices), the regional progress towards SDGs can be assessed at three different levels with quantitative, qualitative and location-based analysis. First of all, every indicator will be contrasted and ranked according to the international or national recognized criteria or references. Among Deqing's 102 indicators, 79 of them have comparable criteria or reference. Secondly, each of the primary SDG is subject to an overall analysis and several focused analysis with the help of the corresponding quantified indicators and evidences. The major achievements and characteristics as well as existing problems will be examined and displayed. Lastly, three SDGs clusters (i.e., economy, environment and society) are analyzed to derive an overall picture of the economic growth, social inclusion, and nature beauty as well as their coherency.

## 4.2 Deqing's progress towards 2030 SDGs

The comprehensive measurement and evidence-based analysis gave overall picture about how far Deqing is from 2030 SDGs. The major conclusion is that the county has made significant economic and social advances while maintaining a good ecological environment over the past 5 years. Among the 79 SDGs indicators of Deqing that have comparable reference criteria or basis, 68 have reached or are very close to the objectives of the United Nations agenda 2030, or are ranking the top of China and even the world (green). 9 indicators need to be improved, and 2 indicators are facing challenges. In general, the implementation of SDGs in Deqing is in very good shape, with 8 SDGs having reached to standard (green), 6 SDGs remaining to improve (yellow), and only 2 SDGs facing challenges (orange). There is a good coherency among the three SDGs clusters (economy, environment and society), with the economic cluster having the highest degree of stability and coordination. There is no significant gap between Deqing's goals and that of the 2030 sustainable development agenda.

Further investigation tells why Deqing has achieved good progress in implement sustainable development in the past years, including adhering to the conviction 'lucid waters and lush mountains are invaluable assets', innovation-driven development, fair development and "Never forget why you started":

(1) 'Lucid waters and lush mountains are invaluable assets'. Deqing has developed a harmonious coexistence between humans and nature, economic growth and social stability, social progress and environmental awareness. The "Lucrative Leaves" project is one of the examples that has highly promoted the coordinated development of the economy, environment and society in the county.

(2) Innovation-oriented development. A variety of innovative activities and high-tech applications have promoted the booming new industries in Deqing, such as the successful upgrading "farmer-made piano" product, "Hill Station" of 100,000 yuan (15,380 US dollars) per bed per year tax legend, the

geographical information characterized "Silicon Valley" road, as well as the future "research Institute economy" and artificial intelligence scheme.. The industrial structure continues to be upgraded. Close cooperation among production, research and applications has promoted more and more innovation and are breeding brand new industries accordingly.

(3) Fair development. Having paid great attention to the balanced development of urban and rural areas, Deqing took the lead in the country to eliminate the differences between urban and rural household registration. Through the project "each town is distinctive", urban and rural areas are developed at the same pace with a special focus on its distinctiveness. In addition, there have emerged a number of unique small towns with Deqing's characteristics. What's more, service and social security have been ensured for both urban and rural areas through the "one broom sweeps to the end" and "one pipe connects to the end" project.

(4) "Never forget why you started, and your mission can be accomplished". Special attention has been given by Deqing governing team in the past ten years to "the consistency of ideas", "policy continuity ", "the succession of the team", practicing on the consensus of "one blueprint ", "succession of leadership", "continuity of one team" and "one assessment for all". With such a long term persistence and continuity, the consensus of ecological civilization has enjoyed more and more popular support, the green development has been pursued constantly from one generation to another. This has delivered significant achievements and created a number of good practices,

It should be noted that there is still some rooms for improvement although Deqing has achieved tremendous progress towards SDGs. For example, the industrial emission should be further reduced, the energy consumption and material consumption should be lessened, the public transport convenience and other aspects need to be further improved, the environmental sector and social sector stability and coordination degree is slightly inadequate. In addition, as natural and social conditions are changing constantly, the SDGs and its indicators also show positive or negative dynamic changes. It is not an easy job to sustain economic growth along with keeping the environment in good shape all the time. It is not an easy task to achieve a high quality economic development while supporting a harmonious and inclusive society. All these challenges have been drawn to the attention of local policymakers.

### 4.3 Outlook

This pilot project is one of the first comprehensive measurements of an entire administrative region's progress towards SDGs with geospatial and statistical information in the world. The proposed data driven and evidence-based approach has taken the geographic location perspective into consideration with the help of multi-scale and multi-temporal geospatial data. Geospatial information played several key roles, including deriving some SDGs indicators, disaggregating social and economic data (such as population) in geographic space, providing accessibility and coverage and other geospatial

parameters, and supporting the evidence-based qualitative analysis and location-based visualization.

There are a number of issues to be further improved or investigated. The first issue is that the UN Global SDGs indicator framework was designed mainly for tracking SDGs progress at national level. It has limitations in the applicability to sub-nation or regional context (such as Deqing), fully and rational coverage of all the primary SDGs of the region in consideration, lack of core indicators, etc. Efforts should be devoted to the development of criteria and guidelines on the localization of the Global SDGs indicator framework, design and development of adequate action-oriented and measurable indicators for developing countries and sub-nations. The second issue is about the comparative criteria or ranking standards which are far more completed. Although having used the SDGs dashboard and the National Plan mandate requirements as well as other references, only 79 of the 102 SDGs indicators are comparable for Deqing, whereas 23 other indicators remained not compared (marked as grey). Besides, the SDGs dashboard may not be suitable for developing countries and sub-national scales. It is therefore imperative to explore and develop objective evaluation criteria. The third issue is related to the acquisition of reliable and up-to-date geospatial and statistical data. It is necessary to develop more operational methods and techniques, such as high-reliability computing of land cover and other core geospatial data, use of social media and other crowd sourcing data, geo-computation of SDGs indicators, and big data-based SDGs monitoring, problem diagnosis and policy simulation.

At present, the United Nations is actively promoting SDGs assessment and monitoring with statistical and geospatial information. This will be advanced if more member countries could create and provide more good practices in this field. The "China (Deqing) SDGs Profile" resulted from the Chinese pilot project and presented in this report is such a good practice. With the release of this report, we hope to share the "China (Deqing) SDGs Profile" with international societies and to demonstrate China's willingness to support 2030 Agenda and its SDGs with geospatial information.

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