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## 1 The planning background

Though Rapid economic growth was registered and various construction projects scored great achievements, we paid a huge price for the natural resources and environment. The conflict between economic development resources and environment is becoming increasingly sharp. The Chinese government set up the mandatory targets of cutting off energy intensity per unit of GDP by 20%, and reducing the total discharge of major pollutants by 10% during "11th five-year Plan" Period. That is the necessary choice for faster development of a resource-efficient and environmentally friendly society and is the only way to push forward economic restructuring and to transfer the growing-up Mode.

The Xichang city has a long history in Western China. In the next decade it will become an international tourism of West China, a best place to live and to take vacations. Under such circumstances the Asia Pro Eco II Project "Policy Instruments for Chinese Sustainable Future: Environmental Policy Integration and Strategic Environmental Assessment for the Energy and Transport Sectors" were proved by EU to be implemented in Xichang, Liangshan Yi Autonomous Prefecture, Sichuan Province.

The energy planning mainly aims at making rational plans for the medium and long term (2010 and 2020) energy consumptions and stepping up the utilization rate of clean energy such as solar energy, electrical potential energy, Liquefied Petroleum Gas, Biogas. This environmental assessments, on the basis of energy planning of Xichang and in the light of the local Natural-social Environment and Resources conditions, analyze the potential environmental impacts on the plan implementation and formulate the control methods and optimum proposal, and even set up guides for future project construction and implementation.

## 2 Planning Profile

### 2.1 Area and Time Scale of the Assessment

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The planning covers the Xichang administrative division; with an area, 2655 km<sup>2</sup>

The base year of environment Evaluation is 2005; the short term target year is 2010; and the long term is 2020.

## 2.2 Objectives of Energy planning

### 2.2.1 Objectives of the Urban Energy Planning

#### (1) Inner City Energy Planning:

By 2010, consumption of standard cores per head is 267 kg/a. The penetration rate of solar energy will be 100% and 12% usage of energy is from solar energy; briquette accounts for 5% of energy; petroleum gas reaches 7%; electric power reaches 76%. By 2020, consumption of standard cores per head is 307 kg/a. 12% consumption of energy will be from solar energy; briquette account for only 2% of energy; petroleum gas reaches 5%; and electric power reaches 81%.

#### (2) Energy planning in Peripheral Regions of inner city:

By 2010, consumption of standard cores per head is 225 kg/a. The penetration rate of solar energy will be 85%, i.e., 10% usage of energy is from solar energy, briquette accounts for 25% of energy consumption, and electric power reaches 65%. By 2020, consumption of standard cores per head is 265 kg/a. The penetration of solar energy will be up to 95%; consumption of solar energy is expected to make up 15% of total energy consumption; briquette accounts for 15% of energy, and electric power reaches 70%.

#### (3) Energy planning in counties of plain:

By 2010, consumption of standard cores per head is 219 kg/a. The penetration rate of solar energy will be 70%, i.e., 10% usage of energy is from solar energy; briquette accounts for 40%, and electric power reaches 50%. By 2020, consumption of standard cores per head is 258 kg/a. The penetration of solar energy will be 80% and the consumption of solar energy is 12% of total energy consumption; briquette accounts for 25% of energy; electric power reaches

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63%.

(4) Energy planning in counties of mountains:

By 2010, consumption of standard cores per head is 172 kg/a. The use of solar energy will be promoted; electric power reaches 5%; firewood accounts for 95%. In 2020, consumption of standard cores per head is 307 kg/a. The use of solar energy will be continually promoted and the consumption accounts for 3% of total energy consumption; electric power reaches 20%; firewood will reach 77%.

### 2.2.2 Objectives of the Rural Energy Planning

By 2010, newly built methane tank will account for 20000 in rural areas, and thereby the penetration rate of biogas consumption exceeds 30%; solar water heaters are extending to 13000 householders, so that the penetration rate of household solar water heaters will be more than 20%; and 15000 householders use firewood and coal sparing stoves. Moreover biogas plants that use organic waste water will be installed for 1,000 cubic meters, and 30 small sized hydro-electric stations will be finished. In addition new built various biogas plants reach 10000 cubic meters.

By 2020, there will be 35,000 methane tanks built up. Thus over 60% householders can use biogas. 23,000 solar water heaters are promoted. As a result, the penetration rate of solar water heaters will grow to more than 40%. Furthermore nearly all householders in high mountain regions use firewood and coal sparing stoves, and biogas plants that use organic waste water will be installed for 2000 cubic meters. Additionally 50 small size hydro-electric stations will be completed, and biogas plants will be built for 15000 cubic meters.

### 2.2.3 Objectives of the Industrial Energy Planning

(1) Clean energy substitute for raw coal and hard coke

By the end of 2010, energy structure must be regulated in order that consumption of electric power may account for about 30 percent of total

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consumption, the consumption of coal may drop to 5% and that of hard coke to 64%. By 2020, about 65% energy consumption is from electric power; the consumption of coal and hard coke drop to 1% and 35% respectively.

(2) Reuse and recycling of waste heat, overpressure and complementary energy

Promote recovery technology of waste heat, overpressure and complementary energy from the production process. By the end of 2010, the recovery of secondary energy such as waste heat, residual energy will reach more than 78% and by the end of 2020 more than 92%.

(3) Develop energy saving technology in manufacturing system

Select a number of enterprises from metal smelting, chemical and steel industries to support the demonstration project of comprehensive energy savings and to reduce enterprises' comprehensive energy consumption. By the end of 2010, energy consumption per unit of industrial value add decreases to 2.05tce/ten thousand yuan and by the end of 2020, 1.55 tce/ten thousand yuan.

## 2.3 Key Projects of planning

(1) Energy-smart buildings scheme includes the optimization of building energy-saving design, the application of various energy-saving materials of most effective thermal insulation, the utilization of energy-saving design of renewable energy, energy-saving strategies in building design, the energy-saving measures for air conditioning systems and so on.

(2) Energy saving street lamps includes technological transformation of lighting, extending of saved lighting products.

(3) Energy saving of government agencies includes energy saving reform of buildings, electric effect reform, application pilot of new technological energy and renewable energy, procurement of energy saving products in government agencies, energy saving official vehicle, energy efficiency rating

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system for newly built buildings and monitor throughout process, statistical methods of energy consumption for government agencies.

(4) Rural energy planning includes rural biogas project, extending plan of solar water heaters, protection projects of Ecology and Environment.

(5) Industrial energy planning includes energy saving project of new Iron & Steel (Group), energy saving project of Kangxi copper group, energy saving project of Xichang aerospace cement.

## 2.4 Analysis of compliance with relevant plan

Energy planning of Xichang city conforms to China's 11th Five-Year Plan for the national economy, China's 11th Five-Year Plan for energy development, China's 11th Five-Year Plan for the development of the western region, China's 11th Five-Year Plan for national economy of Sichuan province, Sichuan's 11th Five-Year Plan and 2020 energy development planning, 11th Five-Year Plan for social development in minority nationality regions.

## 3 Regional Environmental Situations

### 3.1 Evaluation of Water Environmental Quality

According to routine monitoring data of Xichang city, the water quality of Anning River is relatively good with all indicators reach Class III which is stipulated by the Environmental quality standards for Surface Water (GB3838-2002). The water quality of Qionghai is also good with all indicators reach Class II which is stipulated by the Environmental quality standards for Surface Water (GB3838-2002).

### 3.2 Evaluation of Air Quality

Based on routine monitoring data of air quality in Xichang city, water quality in 2005 is as follows: SO<sub>2</sub>, NO<sub>2</sub> in four monitoring points reached the quality standard, PM<sub>10</sub> in three monitoring points, including Qionghai hotel, city hall and state house three monitoring point reached standards. However

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from November to March PM<sub>10</sub> was overproof in Changan monitoring point. Additionally excepting for Qionghai monitoring point, Monthly and annual means of the other three points was overproof.

### 3.3 Evaluation of acoustic environmental quality

The average value of ambient noise level in 2005 was 51.4 dB(A) with a pass rate of 90%. This basically met the standard of all types of functional districts prescribed in the Standard of Environmental Noise of Urban Area (GB3096-93).

## 4 Environmental Impact assessment

### 4.1 The Atmospheric Environment

After the implementation of planning, consumption of coal in household by 2010 will decrease by 11359.65 tce/a compared with 2005, and by 2020 that will be decreased by 26812 tce/a. Furthermore the emission of CO<sub>2</sub> will be reduced by 7610.97 t/a, the emission of SO<sub>2</sub> by 127.23 t/a, the emission of smoke dust by 4.61 t/a. By 2020 the emission of CO<sub>2</sub>, SO<sub>2</sub> and smoke dust decrease by 17964.04 t/a, 300.29 t/a and 10.89 t/a respectively. In comparison with 2005, consumption of coal can be reduced by 257608 tce/a through restructuring of industrial energy in 2010 and emission of CO<sub>2</sub> can be cut down 172597 t/a, by recycling of waste heat and complementary energy, consumption of coal can save 189936 tce/a. As a result that the emission of CO<sub>2</sub> can be reduced 127257 t/a.

In a word, implementation of planning will decrease not only the consumption of coal and firewood in the light of energy utilization, but also the emission of CO<sub>2</sub>, SO<sub>2</sub> and smoke dust, which is of great importance for the protection of air quality.

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## 4.2 Other environmental elements

This is an energy planning. Thus the Aquatic Environment and The Acoustic Environment do not have a marked change because of the implementation of planning.

Although consumption of coal is reduced in the proportion of energy consumption with the implementation of the planning, coal still plays an important part in energy consumption especially in consumption of industrial energy after the implementation of planning. As coal ash and slag can be produced in different sites and the production is always small, the collection and Utilization of coal ash and slag become more difficult. Thus Xichang city should focus on the coal enterprises in order to realize comprehensive utilization and rational treatment of coal ash and slag and to assure that coal ash and slag does not cause adversely impacts on environment.

Moreover, because of the reduction of Straw Burning, solid waste of straw increased. During the implementation of planning great attention shall be paid to the comprehensive utilization of straw, and which can be used for biogas and compost. Before returning in field, straw should be crushed or composted in order to avoid the pollution of atmospheric Environment by straw burning.

## 4.3 Ecological Environment Impact Analysis of the Ecological Environment

With the implementation of planning the back-step marks of incineration of firewood will decrease by 20269 tce/a by 2010, and 30246 tce/a by 2020. That is to say, the incineration of firewood will decrease by 35497 t/a by 2010 and 52970 t/a by 2020, which equals to about annual growing stock of 6.21 million

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mu and 9.27 million mu fuel wood forest respectively. Therefore, Ecological Environment will be projected widely.

#### 4.4 The Social Environment

From perspective of saving energy, this planning mainly focuses on the implementation of energy saving buildings, streetlamps and governmental energy saving projects. This not only decreases energy dissipation of electric power, but also pays attention to extending and utilization of new energy resource namely solar energy. Overall, the impact on the society, after the implementation of the plan, is positive and beneficial.

This planning play a positive role in relieving problem of energy shortage, raising peasants' income, improving quality of life of farmers, pushing for rural social progress and environmental sanitation. Meanwhile the use of solar water heaters and supported products of the rural biogas will promote the development of other related industries.

With regularization of Energy saving and emissions reduction and energy utilizations in steel and iron, cement and metallurgy groups, it is capable of improving Economic benefits through recycling of waste heat and complementary energy to save coal for 214643 t in 2010. The implementation affects the energy consumption of cooperation that deal with the areas of process technology, equipment and material supply. With the renovation of technology and equipments, energy saving and reduction in cost, enterprises can improve their Core Competence and thereupon make better benefits.

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## 5 Rationality Analysis of the Plan

With the analysis of qualitative indicator such as the energy structure index, energy efficiency index, and the atmospheric environment index, even of the Social Environment index and Ecological Environment index, the plan carries out the environmental targets, namely the substitute of clean energy, enhancing the utilization of renewable energy, decreasing consumption of Non-renewable energy resources, encouraging people to consume less energy to meet their needs, controlling the emissions of air pollutants and greenhouse gases that referable to energy consumption, accelerating social economic development and improving the people's living standards, preserving the ecological environment, controlling soil erosion and increasing in the forest coverage. With the comparison with no action and ranking score by experts, moreover with analysis of stationarity and Quantitative Index, the environmental assessments conclude that the Energy Planning and Design is environmentally feasible.

## 6 Mitigation Measures of environmental impact

### 6.1 Environmental monitoring

- (1) Intensify the Supervision and Management, emphasize the government functions
- (2) Strictly implement environment impact assessment and "The three-simultaneity" system
- (3) implement the Monitoring system

### 6.2 Environmental protection measures during construction

- (1) Identify pollution prevention and control measures during construction in the environmental assessment of buildings.

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( 2 ) Bring environmental activities during construction into contract management system and implement the Environmental Supervision system.

( 3 ) Reinforce management of large-scale Construction Machineries and vehicles; adopt the necessary environmental protection measures.

(4) Select the low-noise equipments, carry out careful care and maintenance of equipment, and reduce noise by sound isolation, deceleration, control and a forestation.

(5) Collect the household refuses by constructors in time, and dispose it in a municipal refuse disposal plant.

### 6.3 Pollution prevention measures

Recommendations for pollution prevention and control measures of Xichang city are as follows:

- ( 1 ) Ensure that the emissions to meet the standards
- ( 2 ) thoroughly implement the cleaning process
- ( 3 ) vigorously develop the recycling economy
- ( 4 ) control the sulfur content of coal and gas
- ( 5 ) strictly control key industries
- ( 6 ) tighten the control of Non-point Source Pollution
- ( 7 ) strengthen supervision

### 6.4 Ecological protection measures

- ( 1 ) preserve natural rivers
- ( 2 ) discharge ecologic environment flow

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- (3) strengthen fishery administration
  - (4) recover the forest vegetation

## 7 Public Participation

This assessment was carried out Public Announcement three times, one is a Council Meeting. The other two is public review on the website of Xichang environmental protection network and of Xichang China network, which had no feedbacks on networks. Common complains and suggestions on the Advisory Council are as follows:

- (1) Xichang has long day. Thus solar energy should be included in the plan;
- (2) Xichang is located in the river Valley of Anning River, where it is windy. Thereby wind power probably should be taken into account;
- (3) The Panzhihua Iron and Steel Company will set up a production base in Xichang, whose boiler gas can be reused.

Solar power, wind generating and utilization of Boiler gas from the Panzhihua Iron and Steel Company are not brought into this plan. Nevertheless, in response to the public opinions, the assessments of this plan have given the following rational explanation:

- (1) In terms of rationalization of the plan proposed is as follows: Endeavor to gain support from international, the state finance and provincial finance. Carry out pilot programs of domestic small solar power stations and community solar photovoltaic power stations. Furthermore work on demonstration of large-scale

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interconnected solar power stations in the future.

(2) When future technical and economic conditions permit, carry out investigations and surveys, feasibility study and experiments of wind generating through the data collection of wind power, wind velocity and wind direction.

(3) Coke gas and blast furnace gas can be reused to a large extent in the large scale iron and steel companies. During the design process of Panzhihua Iron and Steel Company base, these resources have been taken into consideration of technological process. Additionally it is not certain, when the building of Xichang base starts and when it can be built on scale. Hence this plan did not bring Panzhihua Iron and Steel Company base into the project.

## 8 Comprehensive Evaluation Conclusion

The Plan proposes to replace coal briquette and firewood with clean and renewable energy such as solar power, biogas and hydropower. This is of great significance to achieve the objectives set out by the Eleventh Five-Year Plan, such as cutting off energy intensity per unit of GDP by 20%, reducing major pollutants by 10%, and constructing resource-efficient and environment-friendly society. Besides, it also plays an important role in protecting the ecology and improving the air quality of both urban and rural Xichang.

The implementation of the scheme will bring about considerable environmental and social benefits. Although the scheme may impose slight impacts on the environment, these impacts can be mitigated through effective measures.

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Hence, the Energy Planning and Design is environmentally feasible.