

# The Opportunities & Proposals for Small Hydropower Development in Latin American & Caribbean Region



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# To Overcome The Growth Barriers by Learning from Global Practice

## China's Experiences- To Improve Capacity Building as Priority

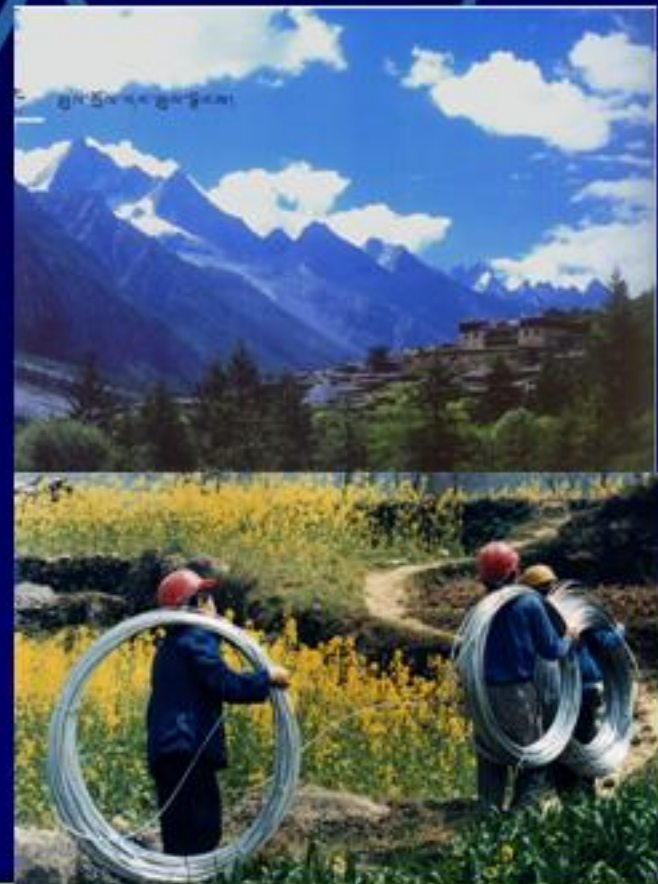
- Indigenous equipment manufacturing
- Open, appropriate & cost-effective technology innovation & transfer
- Training as daily works
- Standards, regulations & typicals adopted by governments
- Planning & policing as basic tasks



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## China's Experiences- Key Projects Promoted Development

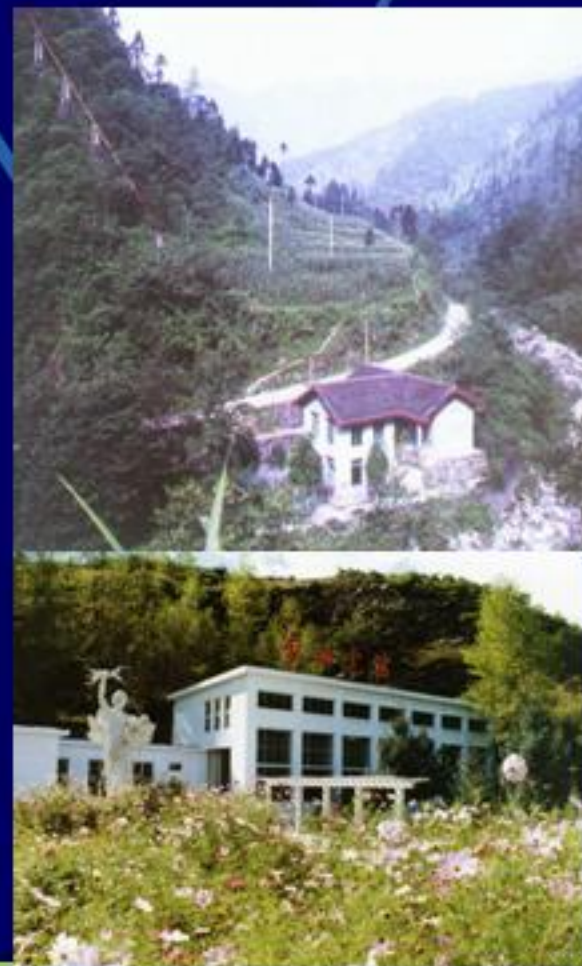
- Led by premier of State Council, organizing several ministries together
- Large scale development  
SHP based RE 5 bil./y ;  
Updated RG 60 bil./5y
- Pay attention on multi benefits  
social, environmental &  
economical



# To Overcome The Growth Barriers by Learning from Global Practice

## China's Experiences- Policy Oriented Development

- “Three-self” policy
- Equal importance on construction & management. Full-scale planning, comprehensive exploitation,
- Self-reliance supplemented by subsidy from government, multiple channel for fund raising
- “Electricity-generating-electricity”
- Multi-purpose exploitation of water resources
- Indigenous equipment manufacture
- Establishment of “SHP Supply Zone”
- Preferential taxation
- Capacity building



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## China's Experiences- SHP Based RE

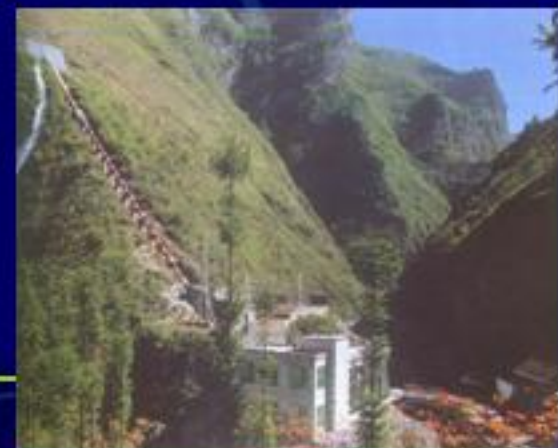
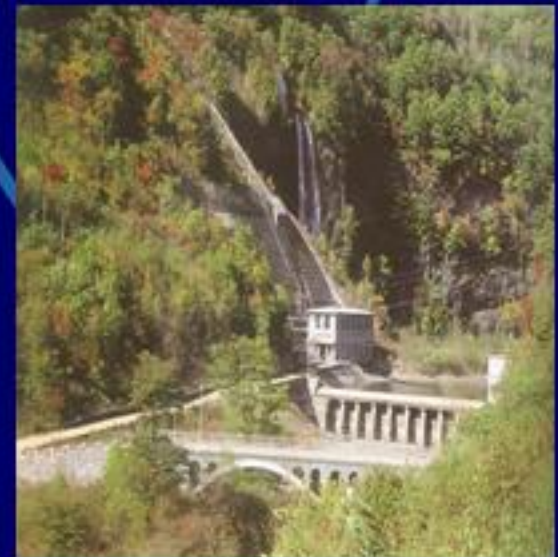
- 98% of renewable energy in China is from SHP at present
- 55% of power generation capacity owned by county level or below in whole China is from SHP
- In 653 SHP Rural Electrification Counties, 99.64% of townships, 99.57% of villages and 99.14% of families had electricity in 2000
- About one half of China's territory, one-third of counties and one-fourth of population mainly relies on SHP



# To Overcome The Growth Barriers by Learning from Global Practice

## China's Experiences-Pay Equal Attention to LHP & SHP

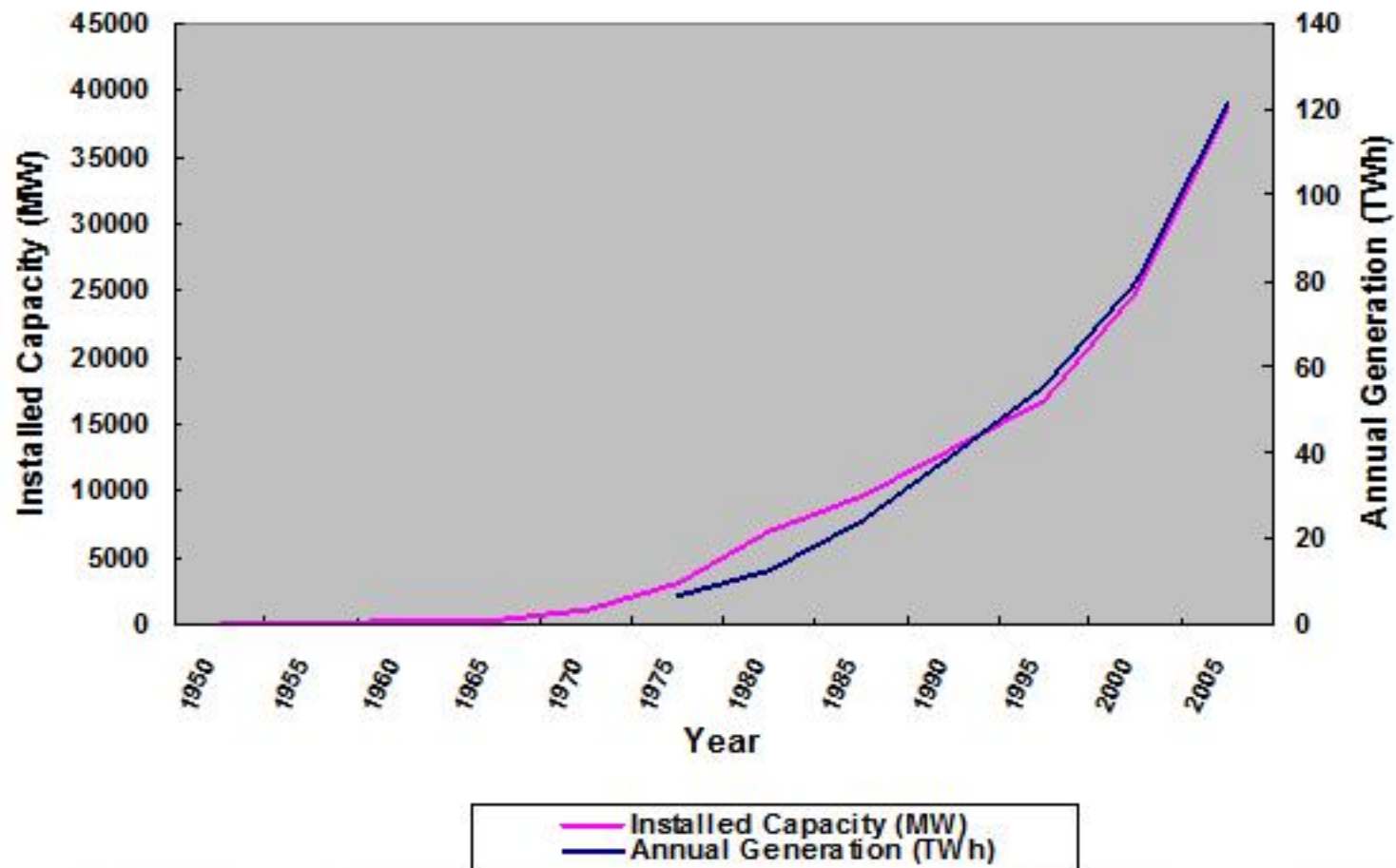
- By the end of 2005, total installed capacity 38534 MW, equivalent to two Three Gorges Project, SHP:LHP=2:3
- In 2005, 3783 MW SHP was added from 2540 SHP stations, total investment in SHP 28.9 billion Yuan
- 347 counties generated electricity from SHP of more than 100 GWh in 2004
- 0.66 million people were employed by SHP enterprises



# To Overcome The Growth Barriers by Learning from Global Practice

China's Experiences-Needs Stimulate Development

## China's SHP Development



# Some Problems of Hydropower Development in LAC Region

Lack of knowledge & equipment to utilize hydropotential





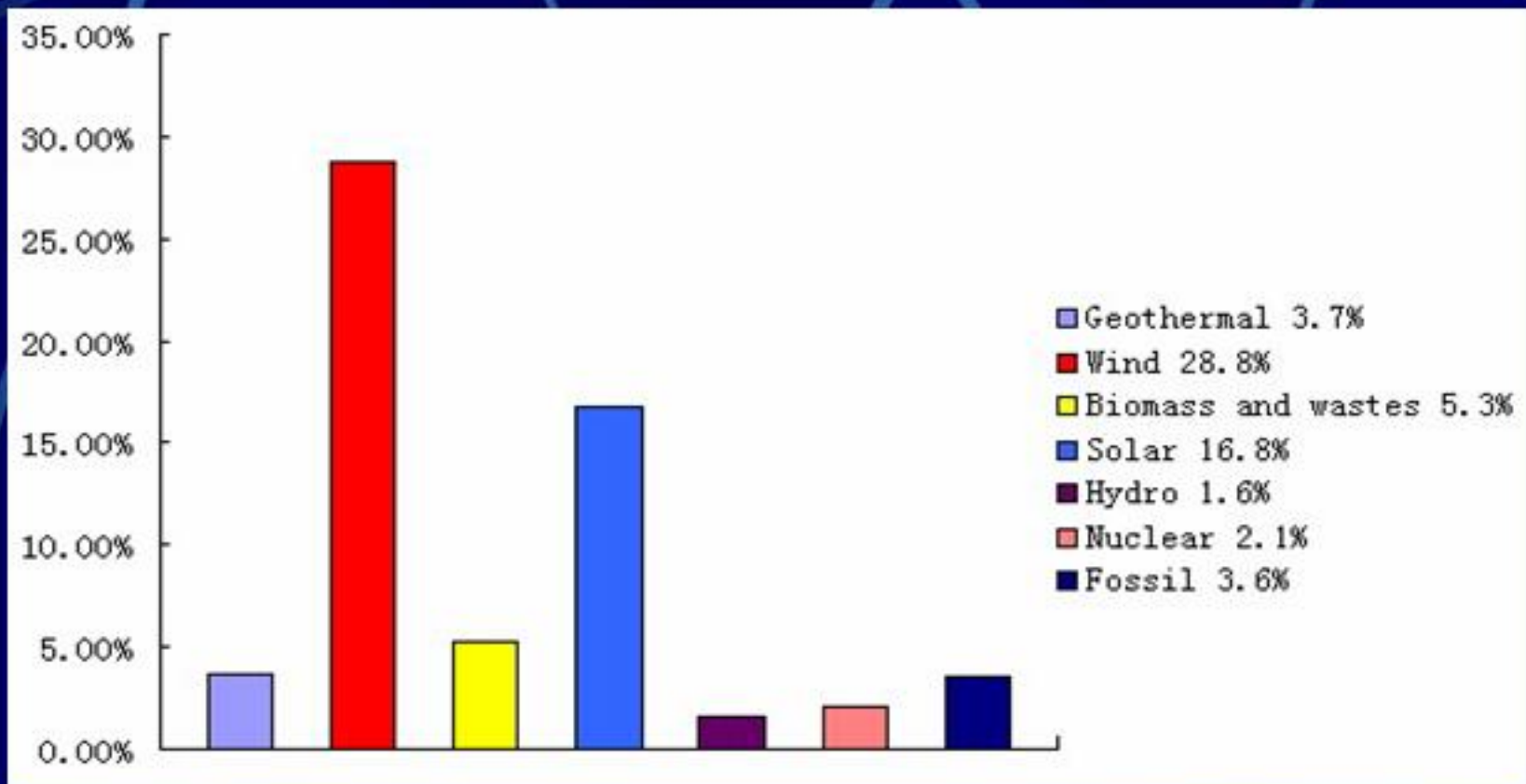
# Some Problems of Hydropower Development in LAC Region

- Electricity consumption is low, with few needs stimulated.
- There are not enough productive use of electricity in rural areas



# Some Problems of Hydropower Development in LAC Region

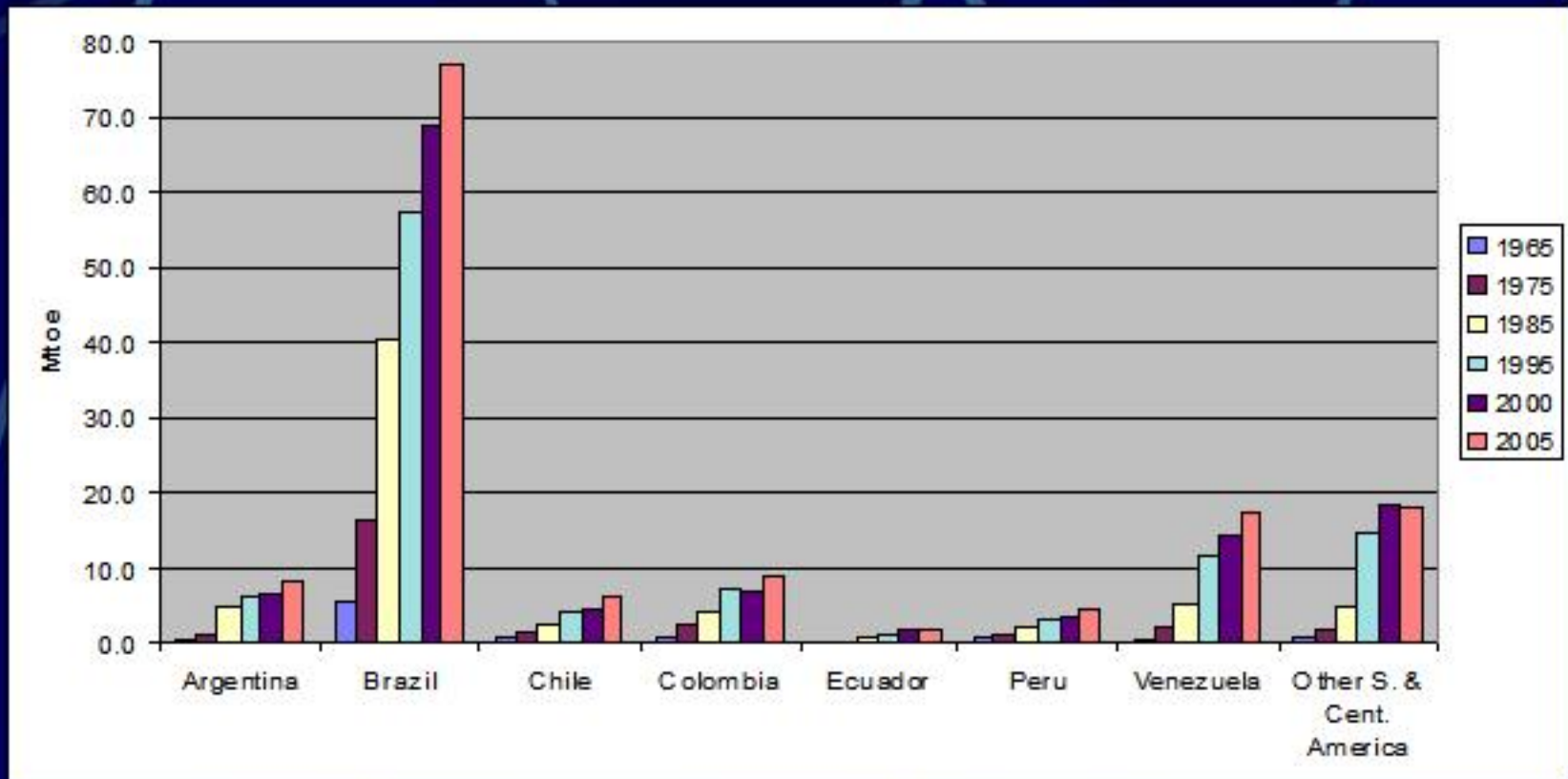
More attention is needed to be paid to SHP development



Average annual growth rate 1994~2004

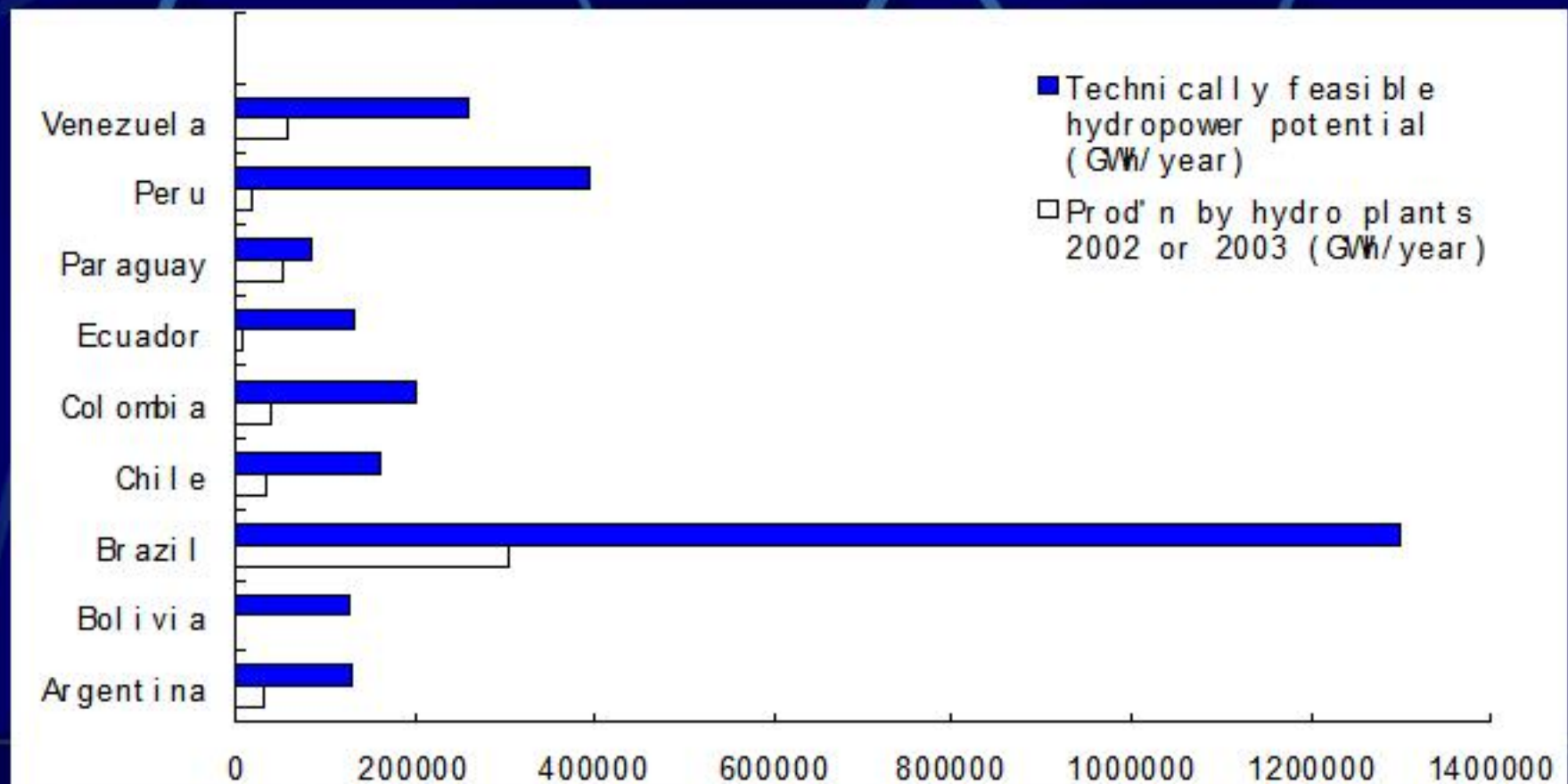
# Some Problems of Hydropower Development in LAC Region

The installed capacity increased very slowly



# Some Problems of Hydropower Development in LAC Region

Total installed of hydropower is still low compared to the hydropower potential



# Hydropower Development in LAC Region

Country	Area (km <sup>2</sup> )	Population (10 <sup>4</sup> )	Technical feasible potential (GWh/year)	Installed Capacity (MW)	Under Construction (MW)	Planned Capacity (MW)
<b>South America</b>						
Argentina	2,780,000	3,749	130,000	9,780	253	9,000
Bolivia	1,098,581	827	126,000	700	90	700
Brazil	8,547,403	17,239	1,300,000	69,087	9,750	34,200
Chile	756,626	1,540	162,232	4,580	300	3,000
Colombia	1,141,748	4,307	200,000	9,000		10,000
Ecuador	256,370	1,288	133,507	1,747	446	527
French Guiana	91,000	16.9	—	116	—	
Guyana	214,969	76.2	—	0.5	105	<1150
Paraguay	406,752	560	85,000	7,410	700	859-2,335
Peru	1,285,216	2,635	395,118	3,032	137.5	1,455
Surinam	163,265	42.9	12,840	120		532-2,230
Uruguay	176,215	330	10,000	1,534	0	350
Venezuela	916,700	2,463	260,720	13,889	3,624	

# Hydropower Development in LAC Region

Country	Area (km <sup>2</sup> )	Population (10 <sup>4</sup> )	Technical feasible potential (GWh/year)	Installed Capacity (MW)	Under Construction (MW)	Planned Capacity (MW)
<b>Caribbean Region</b>						
Cuba	110,860	1,123	1210	57.3	9.4	0.9
Dominica	751	7.1	136.3	7.6	0	0
Dominican Republic	48,734	853	9,000	411.5	2	410
Haiti	27,800	810	767	70		
Guadeloupe	1,780	43.2		6.7	0	0
Jamaica	10,991	262	114	24	0	80
Puerto Rico	8,959	384		85		
St. Vincent & Grenadines	389	10.9		5.6	0	0
<b>Central America</b>						
Belize	22,963	25.7	199	25	7.3	
Costa Rica	51,100	387	43,100	1,296	332	1,040
El Salvador	20,720	631	5,000	407.4		
Guatemala	108,889	1,168	21,500	644	161.6	<2349
Honduras	112,492	662	—	474	62.5	583
Mexico	1,967,183	10,175	49,000	10,500	>1,515	1,210-4,000
Nicaragua	121,428	521	9,541	111	0	<1,767
Panama	77,517	290	11,577	845	0	378-926

# Hydropower Development in LAC Region

- Total hydropower installed capacity 135965 MW, 18.3% of the world total, equivalent to Europe, North America
- Most operations lies in large/medium hydro projects
- Mainly in Brazil (69087 MW), Venezuela (13889 MW), Mexico (10500 MW), Argentina (9780 MW), Colombia (9000MW), Paraguay (7410MW), Chile (4580MW) & Peru (3032MW), Ecuador (1747MW), Uruguay (1534 MW), Costa Rica (1296 MW),
- 33% electricity from hydropower
- Supply 70% population, other 30% decentralized



Itaipu: The second largest hydropower station in the world



Guri (1006 MW): One of the biggest hydropower stations in the world

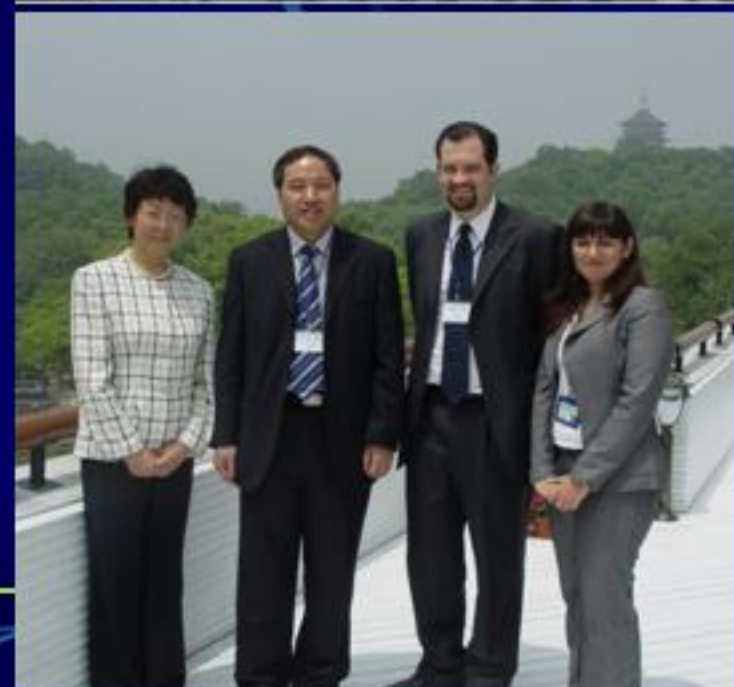


**Thank You!**



# IN-SHP in Promoting SHP development in LAC

- **IN-SHP experts visited 17 LAC countries for site evaluation and technical consultation**
- **Training workshops were organized specially for LAC countries, in Ecuador, Jamaica, Peru and Cuba respectively**
- **Equipment donated for La Pita SHP project in Nicaragua**
- **On-the-job training for engineers from LAC countries in China**
- **International staff from Cuba, Colombia and Argentina worked for IN-SHP in China**
- **Sub-center for SHP will be set up in LAC countries.**
- **Technical & financial supports for RE(2005-2014) in Peru and for mountain SHP development in Colombia**



# IN-SHP in Promoting SHP development in LAC

- OLADE was one of 23 co-founders of IN-SHP in 1994
- Strong support from China's Government & UNIDO since IN-SHP's foundation
- A pioneer in promoting RE of China
- A bridge between China and other countries on SHP
- IN-SHP promotes bilateral cooperation between China and LAC countries, as well as multilateral cooperation within TCDC framework



# Proposal 8

## To promote international cooperation

- External funding, expertise are needed for SHP development in remote areas of developing countries
- TCDC has been a successful mode of international cooperation
- Triangular cooperation is important by bringing funds and advanced management
- PPP is also a tendency



# Proposal 7

To enhance technology innovation

- SHP technology should be open to local people and suitable to local conditions
- Standardization, simplification and serialization of SHP equipment
- Reliable, easy maintenance, automation



# Proposal 6

## To Innovate SHP Development Mechanism & Policies

- SHP development can integrate multiple functions: flood control, water supply, irrigation, fish farming, tourism as well as environment protection
- Social benefits such as poverty alleviation, social security promotion can also be achieved through SHP development
- Preferential policies and financial subsidies are necessary as SHP is beyond sole commercial value, including policy on income tax, VAT, emission tax and import tax
- Effective fund-raising mechanism



# Proposal 5

## To Increase SHP Investment

- SHP will remain one of the best energy sources in the future
- SHP technology is mature, cheap and environment friendly, comparing with other energy sources
- Government should establish foundation for SHP development and encouraging the involvement of IPPs, banks and private companies



Challilo SHP Project in Belize under construction



Pelton turbine in a SHP station of Dominica

# Proposal 4

## To Develop Indigenous Equipment Manufacturing

- Equipment costs accounts for 30%~50% of total project investment
- Import tax and other associated costs make equipment expensive
- Large-scale SHP development is possible only with indigenous equipment manufacturing



## Proposal 3

### To Speed Up Productive Use of SHP Electricity

- Productive use of electricity is a key to the sustainable development of rural areas
- The initial incentives & direction from government is necessary
- SHP Based village-run industry can be the modality





## Proposal 2

### To Replace Firewood with Electricity

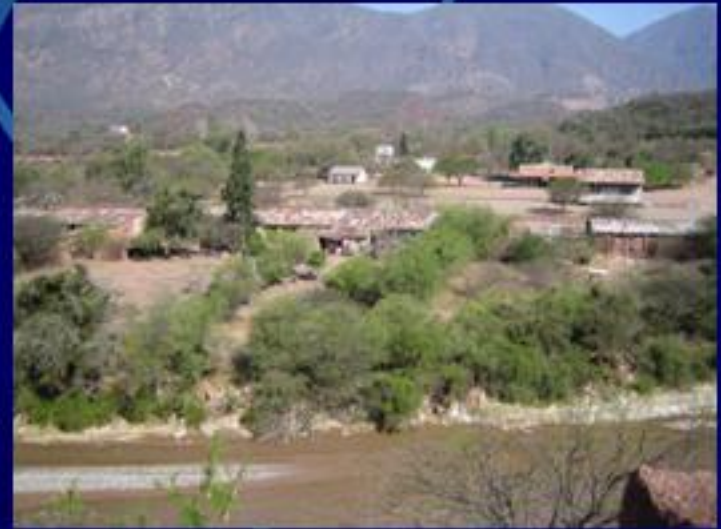
- Deforestation is serious challenge in rural areas of LAC region
- One household needs 2000~3000 firewood per year for cooking & heating
- Indoor pollution
- Collecting wood is a heavy work
- Adding of 2.5 GW SHP can save 10 million tons of wood per year



# Proposal 1

## To Send Electricity to Villages

- Difficult to electrify villages using conventional approaches
- Long distance from national grid
- No sufficient transportation facilities
- Low density of load
- Dispersed inhabitation
- Decentralized SHP development fits the actual situation



# To Overcome The Growth Barriers by Learning from Global Practice

## China's Experiences- Electricity Productive use by PPP Modality

- Decentralized development
- Multi-channel funds collecting
- No electricity, no development; village-run industry; create job opportunities; 1/4~1/3 income from SHP

