Country Profile: Vietnam, new ICOLD member

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ICOLD ON THE FRONT LINE FOR DEVELOPMENT

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At the beginning of 2007 only eight years remain to face up to the challenges that humanity has established in the Millennium Development Goals (MDGs) to be achieved by 2015. Different international reports indicate that great efforts are being made to improve access to drinking water and basic sanitation, but these efforts are still not sufficient, and there are regions in the world, mainly in Sub-Saharan Africa, where all types of actions have to be taken urgently.

The case of Africa is well known. Seventy per cent of the population lives in darkness, with obvious consequences: No Light, No Clean Water, No Health Care, and No Education. This situation continues while less than 7% of the hydroelectric potential is exploited in the continent. And Africa is only the most extreme case of a world hungry for clean renewable power.

Solving the world's water and electricity problems is a multi-faceted issue, and it must be tackled within the framework of the Integrated Water Resources and Energy Management. All kinds of potentially viable actions must be urgently applied, and experience has shown that dams and reservoirs (large, medium-sized and small) are a very effective and efficient option on many occasions, on the understanding that they must be constructed and operated in an environmentally sustainable and socially equitable way. Dams bring development and well-being for hundreds of millions of people.

It is therefore the duty and mission of ICOLD to promote and develop dams and hydropower in the developing world, Africa being the priority. ICOLD and its 85 National Committees represent great human potential, with more than 10,000 professionals and experts in the field of dams. There are also 24 Technical Committees, in which approximately 400 experts participate, responsible for disseminating State of the Art reviews on technical, economic, social and environmental matters as pertaining to dams. Therefore, ICOLD is available to all the international organisations, governments and other civil authorities, to help achieve the sustainable development targets.

ICOLD also has to make alliances in order to accomplish that mission. That is why we are striving to give new impetus to IWALC, and we are actively looking for cooperation with United Nations organisations. On the public relations front, our new website is finally online and we hope it will serve as a tool to accomplish ICOLD's mission.

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IN THIS ISSUE

Country Profile : Vietnam, new ICOLD member

Vietnam is one of the two newest members in ICOLD. We present here a few facts about this country and its hydroelectric resources and potential.

The country is approximately 331 688 square km (128,066 sq mi) in area, which is slightly smaller than Germany. The topography consists of hills and densely forested mountains, with level land covering no more than 20 percent. Mountains account for 40 percent, hills 40 percent and forests 42 percent. The northern part of the country consists mostly of highlands and the Red River Delta. Phan Xi Păng, located in Lào Cai province, is the highest mountain in Vietnam at 3143m (10,312 ft). The south is split into coastal lowlands, Annamite Chain (central mountains) with high plateaus, and the Mekong River Delta. Mountains 500 m and more high occupy a third of the land. The highest mountain is Fansipan, at 3143m.

The climate is tropical and monsoonal; humidity averages 84 percent throughout the year. Annual rainfall ranges from 120 to 300 cm (47 to 118 in), and annual temperatures vary between 5°C (41°F) and 37°C (99°F).

There are 18 600 km² (1993 est.) of irrigated land in the country, out of 325 360 km² of land area, 55 250 km² of which is arable.

As a result of several land reform measures, Vietnam is now the largest producer of cashew nuts with a one-third global share and second-largest rice exporter in the world. Besides rice, key exports are coffee, tea, rubber, and fishery products. However, agriculture's share of economic output has declined, falling as a proportion of GDP from 42% in 1989 to 26% in 1999, as production in other sectors of the economy has risen. Tourism has become an increasingly important industry in Vietnam. There are over 3 to 3.5 million annual visitors.

Economy

In 1986, the Sixth Party Congress of the Communist Party of Vietnam formally abandoned its centralized planned economy and began introducing market elements as part of a broad economic reform package called «đổi mới» («Renovation»).

In many ways, this followed the Chinese model and achieved similar results. On one hand, Vietnam achieved around 8% annual GDP growth from 1990 to 1997 and continued at around 7% from 2000 to 2002, making it the world's second-fastest growing economy. Simultaneously, investment grew three-fold and domestic savings quintupled.

On the other hand, urban unemployment has been rising steadily in recent years due to high numbers of migrants from the countryside to the cities, and rural unemployment, estimated to be up to 35% during non-harvest periods, is already at critical levels. Layoffs in the state sector and foreign-invested enterprises combined with the lasting effects of a previous military demobilization further exacerbated the unemployment situation. The country aims to become a member of the WTO, perhaps as soon as October 2006. In May 2006, Vietnam negotiated a bilateral trade agreement with the US that marked the completion of the bilateral negotiations with WTO members the country needed to qualify for accession to the organization. Among other steps taken in the process of transitioning to a market economy, Vietnam in July 2006 updated its intellectual property legislation to comply with TRIPS.

Vietnam is still a relatively poor country with a GDP of US$70 billion (2006 estimate). This translates to approximately US$820 per capita. Inflation is estimated at 14% per year in 2004.

Electricity

Although Vietnam's per capita electricity consumption is among the lowest in Asia, demand has risen in recent years, straining the country's limited generating capacity. Rapid commercial sector growth, population migration to major cities, and elevated living standards have all contributed to a growing demand for electricity. In 2002, Vietnam had a total electricity generating capacity of 8.3 gigawatts (GW) and generated 34.5 billion kilowatthours (kWh) of electricity, of which 60% was hydropower. This share is expected to decrease in the future, despite the building of new hydroelectric dams, because of a number of new fossil fuelled power plants.

Hydroelectric plants in operation

No	Name	Capacity (MW)	River	Location	Dam's heighth (m)	Cost of construction (106 US$)	First operationnal year
1	Thac Ba	108 MW	Chay	Yen Bai province	45	110	1972
2	Da Nhim	160 MW	Da Nhim	Lam Dong (Da Lat) province	38	50	1964
3	Hoa Binh	1920 MW	Da	Hoa Binh province	128	1500	1984
4	Y-a-ly	720 MW	Se-San	Gia Lai – Kon Tum province	71	700	2001
5	Vinh Son	66 MW	Dak Phan	Binh Dinh province	40	70	1994
6	Song Hinh	70 MW	Hinh	Phu Yen province	43	100	1999
7	Thac Mo	150 MW	Be	Binh Phuoc province	46	150	1995
8	Tri An	400 MW	Dong Nai	Dong Nai province	40	400	1988
9	Ham Thuan	300 MW	La Nga	Lam Dong – Binh Thuan province	93	300	2001
10	Da Mi	175 MW	La Nga	Binh Thuan province	72	180	2001

The rural electrification program has been accelerated. The first Rural Energy project brought electricity to approximately 500 000 households from 2001 to the end of 2004. A $220 million World Bank loan for the project is designed to bring power to 2.5 million households According to the Vietnamese government, village electrification will reach 80% in 2010 (the figure is now slightly above 50%). Similarly, 90% of the total Vietnamese population is expected to be connected to the grid in 2010 (now 87%).

With the growing industrial demand, electricity demand in Vietnam is forecast to grow 15%-16% per year until 2010. Vietnam currently buys power from China to prevent shortages in the North, and plans to begin purchasing from Laos in 2008.

In January 2005, EVN announced its intention to increase electricity production by 20% within the year and to increase generating capacity to 11 400 MW in 2005 (and 17 500 by 2010).

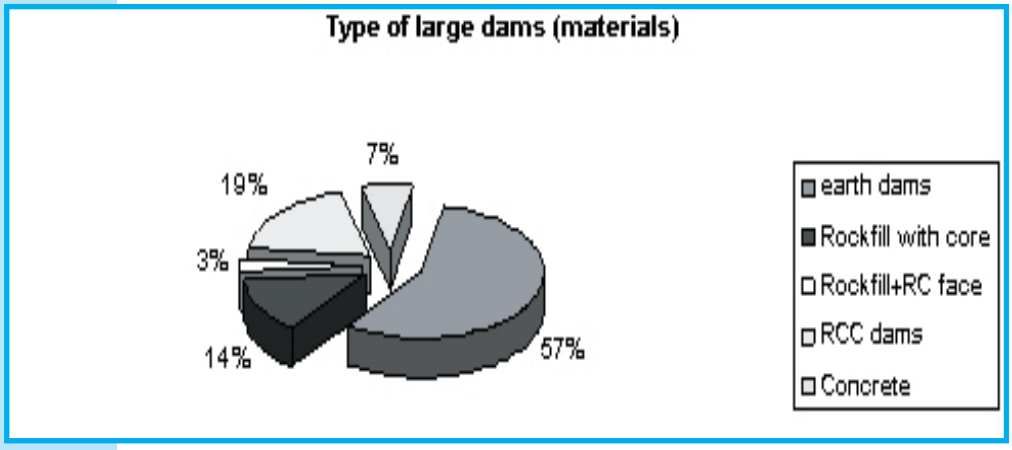
Vietnam currently has five hydroelectric developments underway. The country's Son La project, anticipated to have a generating capacity of 2400 MW by 2012, will be the largest hydroelectric project in Vietnam when completed. In September 2004, construction began on the Ban Ve hydroelectric power plant, expected to begin operations in 2008. EVN began work on four additional hydroelectric projects in late 2004. The Dong Nai 3 and Dong Nai 4, both located in the Central Highlands region, are expected to be completed within four years and to provide approximately 520 MW generating capacity. In December 2004, EVN began construction of the Se San 4 hydropower plant in the Central Highlands provinces of Gia Lai and Kon Tum. The plant is anticipated to have a capacity of 330 MW and to generate 1,390 million kWh per year. Vietnam also plans to build three additional plants in the region by 2010.

In March 2004, the Vietnamese government approved construction of the 2.4 GW Son La hydroelectric project, which began late 2005. One third of the $2.3 billion investment has been earmarked for the resettlement of families living in the 44 700 hectares to be flooded by the reservoir. The plant is expected to be operational by 2015.

Lastly Vietnam plans to complete its first nuclear power plant by 2020 as an alternative means of meeting demand. In December 2004, the Vietnamese Ministry of Science and Technology submitted a pre-feasibility study for the 2000-MW nuclear plant to the National Assembly.

Dams in Vietnam

Vietnam has a historical tradition in water engineering. Old earth dyke systems in the Red river basin have been built in the North since the 12th Century. The first big channels were dug in the Mekong delta in the South 300 years ago. Some large irrigation systems consisting of weirs, canals and sluices were built in the 1920s and 1930s. More than 2500 pools (each has a storage capacity of less than 5 million m^3) and 500 reservoirs have been built. Since 1990, on the lower Da river in the North-West (70 km from Hanoi), there has come into operation a big Hoa Binh reservoir with 9.5 billion m^3 capacity (V) and a rockfill dam 128m high with 1920 MW installed capacity. Now a bigger scheme is under construction upstream (it is planned to operate the 1st turbine in 2009) with a storage capacity of 12.5 billion m^3 and a roller compacted concrete dam 139 m high (H) rated at 2400 MW.



In Vietnam the highest earthfill dam is 60m, clay core-wall rockfill (CCR) dams are H=54÷128m, concrete face rockfill (CFR) dams are 70÷119m, traditional gravity concrete dams are H=15÷46 m, roller compacted concrete (RCC) dams are H=53÷139m. Beside common technical demands, dam construction calls for much special engineering research work such as flood frequency design, optimum combination of locally available materials, dam and spillway sizes, river diversion versus peak flood, dam material processing, in the light of natural conditions.

Reservoirs fall into two categories, reservoirs designed specifically for energy production, and multipurpose reservoirs which must comply with strict rules regarding operation for flood mitigation, water supply, irrigation and power generation. Today, there are three ambitious ten-year National Programs in operation (2005-2015) with more than US$10 billion investment:

- Program for Medium and Small Water Systems in dispersed areas in highlands and mountains aiming at local water demand satisfaction and poverty reduction;
- Program for Large Multipurpose Water Systems with big reservoirs (V=0.3÷1.5 billion m^3) and high dams (H=50 ÷115m);
- Program for Large Hydro Power Plants with high power capacity (P=150÷2400 MW).

Hydroelectric Potential

Hydroelectric plants to be built by 2020

No	Name	Capacity (MW)	River	Location
1	Nam Huy – Dai Thanh	342 MW	Gam	Tuyen Quang province (under construction)
2	Son La	2400 MW	Da	Son La province
3	Dai Ninh	300 MW	Da Nhim	Lam Dong province
4	Rao Quan	70 MW	Rao Quan	Quang Tri province
5	Se San III	273 MW	Se San	Gia Lai – Kon Tum province
6	A V-ong I	170 MW	Con	Quang Nam province
7	Song Con II	70 MW	Con	Quang Nam province
8	Ban La	? MW	Ca	Nghe An province
9	Song Tranh II	200 MW	Tranh (connect with Thu Bon)	Quang Nam province
10	Dak My IV	200 MW	Tranh	Quang Nam province
11	Dak Drinh	97 MW	Tra Khuc	Quang Ngai province
12	Se San IV	330 MW	Se San	Gia Lai – Kon Tum province
13	Dong Na III and IV	550 MW	Dong Nai	Lam Dong province
14	Buon C-op	280 MW	Serepok	Dak Lak province
15	Anh Khe – Ka-nak	150 MW	Ba	Kon Tum province
16	Phi-Krong	110 MW	Se San	Gia Lai – Kon Tum province
17	Song Ba Ha	250 MW	Ba	Phu Yen province
18	Lai Chau	800 MW	Da	Lai Chau province

Already Exploited: 18 000 millions kWh
Economically feasible: 52 millions kWh
Technically feasible: 72 millions kWh
Theoretical: 309 millions kWh

The economically and technically feasible figures have been recently revised downward due to environmental constraints (displacement of populations).

Today's hydroelectric dams are relatively new (see tables). There are 10 multipurpose dams, either earthen dams or rockfill dams. Their operational problems are mainly due to their multipurpose nature: it is difficult to optimize operation when faced with conflicting priorities: flood protection, maximizing electricity production, conservation of water resources for the down stream regions, etc. There are also more specific problems with silting, due to erosion in the catchment area subjected to violent rains and deforestation. The reservoir capacity is reduced, which threatens the flood protection role. Lastly, small and old dams are insufficiently maintained, due to lack of money.

A promising future

Electricity of Vietnam public utility has submitted a very ambitious plan to build 45 dams for hydroelectricity in the next twenty years. Among them, the biggest is the Son La Project. With 2400 MW (10 generators) installed capacity, it is expected to produce 9000 MWh. (See tables). According to the announced figures, Vietnamese hydroelectric capacity will increase by 5080 MW by 2010 and 7220 MW by 2020. This would represent a large fraction of the 10 000 MW yearly world market (5% and 7% respectively). Some have questioned the capacity of Vietnam to accomplish this ambitious plan, and expect that gas fired power stations would benefit much more from increased demand, because they are more easily financed through BOT-type schemes and because Vietnam is quite rich in gas resources. ●