

# The Cagayan Valley Railway Extension Project

Gary L. Satre

## Introduction

Between the towns of Cordon, Isabela and Enrile, Cagayan in northeastern Luzon of the Philippines, with persistence, you will find traces of a railway. They consist of just 63 km of developed sub-roadbed within a distance of 170 km. This is today's Cagayan Valley Railway Extension Project. The story starts from around the early 1880s and has had as many twists and turns in it as a planned route until today. The proposed line begins from the central Luzon plains, climbs through the rugged Caraballo mountains, and descends into the verdant and rich Cagayan Valley itself. Meanwhile, a project profile in the Railway Planning Division of the Department of Transportation and Communications (DOTC) keeps the dream alive, while other documents gather dust in various government offices including the National Economic Development Authority (NEDA).

## Stumbling onto Obscure Philippine History

After visiting NEDA's library one afternoon in 1996, I went home flabbergasted. You see, in late 1994, I became re-acquainted with model railroads. Running the O-scale (1:48) electric trains of my childhood and riding real trains cemented my love for railroads. Travels in the US Navy in the late 1960s plus being a permanent resident of the Philippines since 1981 has exposed me to trains here as well as in Taiwan, Hong Kong, and Japan. As I read the October 1994 issue of *Model Railroader*, I marveled at the room-size layouts featured in that edition. 'What to model?' I said to myself. I first considered a portion of Metro Manila's LRT Line 1—skill levels quickly dampened my enthusiasm. 'But what if the tracks were extended from San Jose, Nueva Ecija into the Cagayan Valley?' I had often seen San Jose Station from my passing bus many times in my travels north. Leaving the library after reading a 1974 report, I

realized that my vision had a history! Up to that chance encounter that afternoon, I had no idea there was an *actual* Cagayan Valley Railway Extension Project!

## Late Arrival of Philippine Iron Horse

Railroads arrived late in the Philippines. Spain found comfort in old traditions while the rest of Europe was being challenged by new technology. The Industrial Revolution had started its sweep from England and no other symbol of the modern age was more familiar than that of the steam locomotive. After its invention in Britain in 1825, the railroad reached France in 1828, Germany in 1835, the Netherlands in 1839, and Spain in 1848. The Spanish Revolution of 1868 was followed by a period of political turbulence for 7 years. During that time, the 1872 Cavite Mutiny and the writings of Filipino 'propagandists' in Madrid, showed clearly that reforms were desperately needed in the Philippines.

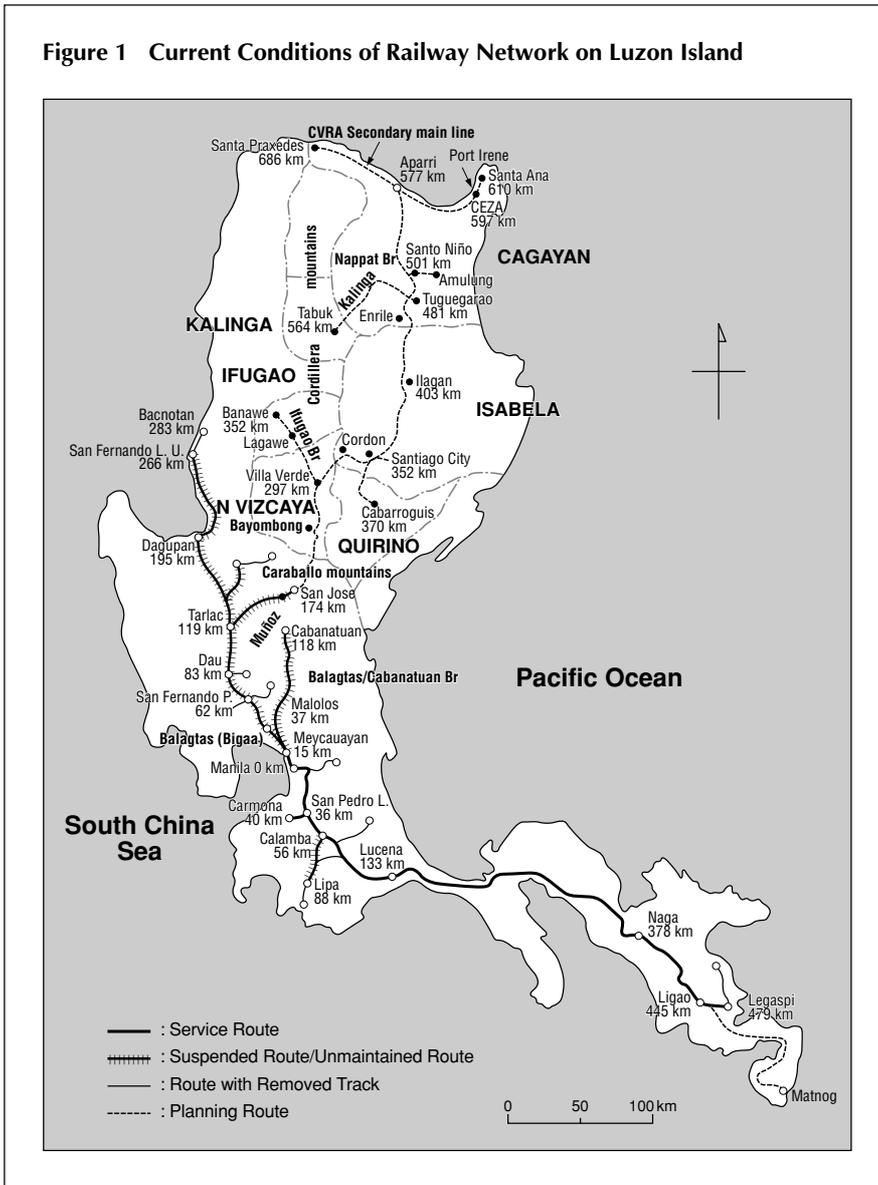
## Royal Orders for Railways

In June and August 1875, royal orders were issued for general plans and ground rules for rail tracks in the islands. Complying with the first order, Don Eduardo Navarro submitted his plan for government approval on 5 February 1876. It was granted nearly 3 years later with a Royal Order of 19 July 1880 directing that survey work be started on the main island of Luzon. A prototype line was to be built north from Manila to the nearby province of Bulacan. This section eventually became part of the original main line. Survey findings showed that additional lines could be built too. The first 196-km line (Fig. 1) was opened to Dagupan on 24 November 1892. Each section entered operation as it was finished. A Royal Order of 28 April 1882 directed the



San Jose Station would have been the first stop for travellers from the Cagayan Valley through the Caraballo mountains if the rail line had been completed in the mid-1960s. Since 1982, when the Tarlac branch line was abandoned, the station has been the victim of squatters and indifference. Now the Philippine National Railways is tearing down the station, apparently to prepare for a better facility should the line be extended north. (Author)

**Figure 1 Current Conditions of Railway Network on Luzon Island**



northern tracks be extended from Bigaa (present-day Balagtas, Bulacan) to Tuguegarao, Cagayan. This is the very first mention of a railroad into the Cagayan Valley. A south line to Albay, called for in the same order, was eventually built during the American period.

### North Line's Operation

The North Line was the narrow gauge (3'6"/1067 mm) used widely in all British colonies. The winners of the concession, the English-owned Manila Railroad

Company (MRC) of London, adopted this gauge to save money on sleepers and to reduce banks on curves. The narrow gauge forced lower train speeds and the motive power was provided by wood-burning tank engines rated at 32 tons. Local railroad historians call them the Dagupan type. English engineer and General Manager, Horace L. Higgins later told the Americans that he favored bigger locomotives in the 40- to 45-ton range. He also blamed the Spanish for causing cost overruns. They insisted on numerous buildings and stations. Higgins said the use of concrete instead of lime also drove

up costs needlessly.

Passenger revenue exceeded freight by a ratio of 3:1. The shipment of farm produce carried by the railway increased more than 100%. The economic impact was apparent within a 10-km belt on each side of the line.

Shortly after his return from Hong Kong on 26 June 1892, Dr Jose Rizal, the country's national hero, wrote of his 120-km train trip to Tarlac from Manila. It took 5 hours 40 minutes. His journey was 2 weeks before his exile to Dapitan. This gives a foretaste of the railway's fate—first during the war of independence and later in the conflict with the Americans.

### Prolonged Conflict with New Colonizers

The Filipinos were nearly successful in their fight for freedom from Spain. However, the Americans were fresh from victory in *their* war with Spain and claimed what they thought was rightfully theirs under the terms of the Treaty of Paris. Apolonario Mabini, chairman of the Revolutionary Government Cabinet was adamant. On 15 April 1899, he answered official American assertions by saying that the US claim to the Philippines was null and void because the Filipino people had not been consulted—war was the only alternative. As a strategic resource, the railway was caught in the middle of the conflict. However, it was able to operate commercially for more than 5 years—long enough to earn a place in Filipino life and economics.

### Railroad Expansion in American Period

On 4 April 1899, the first American Commission to the Philippines arrived in Manila. Led by Cornell University President Jacob Gould Schurman, the so-called Schurman Commission was to survey conditions in the islands and

extend American goodwill. It largely failed due to the Philippine–American War that had erupted just 2 months earlier. The Americans quickly realized that what they had inherited from the Spanish was anything but a modern nation. Under Section 8 of the Regulative Principles, the Schurman Commission instructed that ‘construction of roads, railroads, and other means of communications and transportation, as well as other public works of manifest advantage to the Philippine people will be promoted.’ Thus transportation was given a high priority. Railroads had played a major role in building the US into a wealthy industrial nation. The growth was largely influenced by the need to link ports with sources of raw materials such as lumber and coal. Farmers also needed a way to transport their harvests to market. This experience shaped the Commission’s recommendations.

The Filipinos resisted strongly and their tenacity won the grudging respect of the American forces. The second Philippine Commission was headed by William H. Taft, later America’s 27th President. It was reminded via instructions from President William McKinley that the colonial government ‘is not designed for our satisfaction or for the expression of our theoretical views, but for the happiness, peace and prosperity of the people of the Philippines.’ The Taft Commission’s first law was an act allocating P2 million (US\$1 million) to be spent on road and bridge repairs.

Operation of the MRC was returned to its British owners on 20 April 1900. In the first 8 years of the American period, most of the railroad’s revenues came from passenger operations by a 2:1 ratio over freight. Some 95% of the passenger revenues came from Third Class.

By 1906, four branch lines had been added, including a 91.5-km Bigaa–Cabanatuan, Nueva Ecija section, the closest the tracks got to the Cagayan Valley at that time. Reorganization

followed—the MRC of London became an American firm registered in New Jersey and on 7 July 1906, the Taft Commission allowed the new MRC to build additional lines north and south of Manila.

By May of 1929, the original North Line was restored and extended up to San Fernando, La Union. San Jose, Nueva Ecija within sight of the Caraballo mountain foothills got railroad services in February 1939. The MRC logo was still on the station windows up to late 1995 but the branch line, under the control of the successor Philippine National Railways (PNR), is not used and its rails were pilfered long ago.

### Early Interest in Cagayan Project

William Kline of the New York Trading Company showed interest in extending the line to Bayombong, Nueva Vizcaya, about 270 km north from Manila. Vanessa J. Glynn, a British researcher, commented in her Master’s thesis for the University of the Philippines, ‘Despite only cursory investigations, Kline did not foresee any

engineering difficulties, and had ambitions for the line to be continued to the Cagayan Valley all the way to Aparri on the northeastern coast of Luzon.’ American businessman Neil MacLeod was just as ambitious but more experienced, having attempted to send the rails to Antipolo, Rizal via Sta. Ana, San Juan and Marikina. He showed interest in a Cagayan Valley route ‘to tap the tobacco provinces, especially Isabela.’

Financial problems and a scandal troubled the MRC and the government nationalized the company in January 1917. However, although owned by the government, MRC still operated as an autonomous business. Development of the Luzon railroad network continued up to the start of the Pacific War in 1941. Glynn concluded, ‘although over-ambitious and ultimately flawed, the railroad policy of the American administrations on the Philippines was throughout based on what was sincerely believed to be the best interests of the Philippines. Development of the country, rather than exploitation was the guiding principle in Philippine railroad policy.’ She continued by making this astute



*This is a trace of the abandoned Tarlac–San Jose branch line a short distance from the Maharlika Highway in San Jose City, Nueva Ecija.* (Author)

observation, 'It is possible that railroads *did not fire the imagination* (my emphasis) of the Filipino leaders at a time when bigger questions dominated, or it could be that American policymakers believed that they knew what was best for the colony and *neglected to consult the Filipinos*, (my emphasis) except where constitutionally required to do so.' One can see traces of these attitudes even today.

---

### Independence and Postwar Reconstruction

---

When the Philippines became independent in July 1946, the nation faced the heavy burden of rebuilding its badly war-damaged economy and infrastructure. During the Elpidio Quirino administration, import and exchange controls were imposed to prevent bankruptcies and stop the spread of a communist-led rebellion. During this period, Republic Act (RA) 470 of 9 June 1950 authorized the MRC to borrow P45 million (\$22.5 million), allowing the MRC to rehabilitate, restore, and extend its lines from San Jose, Nueva Ecija to Echague, Isabela (108 km) and onwards north to

Aparri, Cagayan (440 km). Meanwhile, the manufacturing sector continued growing from 3% of the GNP in 1949, to 14% in 1956, and 18% in 1960. Domestic investment also grew—from 55% in 1959 to 88% in 1961. More than 5000 new businesses were started in 4 years of the Quirino controls, which lasted 12 years. The 1963 World Bank report said, 'The progress of the Philippine economy during the highly protectionist decade of the 50s was one of the more impressive records of economic gain among less developed countries.'

---

### Magsaysay as MRC General Manager and Philippine President

---

Prior to his election as President in 1953, Ramon Magsaysay was General Manager of MRC for the last 3 months of 1951. This firsthand experience aided him in seeing the importance of modernizing the railroad. A new fleet of diesel locomotives was acquired from Japan through the Reparations Agreement signed in May 1956. Unfortunately, the US Japan-first

policy, which was designed to contain communism, made it difficult for countries like the Philippines to get aid. Thus reparations were too little, too late. During the Magsaysay administration, the North Line was extended beyond San Fernando, La Union to Bacnotan.

A total of P78 million (\$39 million) was budgeted for 4 years by RA 1867 of 22 June 1957 to extend the line from the end of the San Jose branch to Tuguegarao. Out of this amount, P48 million (\$24 million) were reparations from Japan. At last, work was about to begin on the Cagayan Valley project, 75 years after the first Spanish royal order. The track distance was about 306 km and construction began in the sections on the gently rolling plains between Cordon and Tuguegarao in July 1961. A tunnel through the Caraballo mountains was to be built later.

---

### What Went Wrong?

---

Building ground to a halt a little less than 4 years later with NEDA saying that about half the appropriated amount had been spent. What went wrong?

PNR Civil engineer Lope M. Padiernos was the Assistant Supervising Railroad Engineer during the construction. In an interview a year before he died last July, Mr Padiernos said he believed that the funding was adequate 'at that time' to complete the project. He added that only about P6 million (\$3 million) was actually spent. However, release of those funds was too slow by the national government. Sub-roadbed sections were built in bits and pieces and not in sequence from Cordon to Enrile, Cagayan, less than 11 km from Tuguegarao. Ramon J. Jimenez, now PNR's Acting Assistant General Manager for Operations and Maintenance was on the survey team for the Caraballo Tunnel section. The other sections were San Jose–Maringalo, Maringalo–South Portal, South Portal–Bayombong, and Bayombong–



Traces of what was once a four-track stub yard are seen amongst the squatter shanties near San Jose Station. (Author)

Tuguegarao. While construction was proceeding, so was a presidential election campaign. Magsaysay was killed in a plane crash in 1957 and Carlos P. Garcia, his Vice President, took over and served the remaining months of Magsaysay's term before running for a 4-year term of his own. Padiernos mentioned how the supporters of the incumbent Garcia attempted to make the project a local campaign promise as if to say 'Vote for Garcia, get the railway.' Rails and sleepers were sometimes taken and placed in front of municipal halls to drive the point home.

Garcia was elected President while his Vice President, Diosdado Macapagal, came from a different political party. Garcia introduced the 'Filipino First' policy. It helped the country just as import and currency controls did, but angered the many foreign business interests in the country. It also paved the way for Macapagal's election as President in 1961. In 1962, Macapagal introduced his Decontrol Program. For the first time, the peso, which had been pegged at P2 to \$1, depreciated to P3.90 against the greenback. This happened while the extension line was being constructed. Mr Jimenez pointed out that during the subsequent Marcos administration, the President went to Tokyo for a 3-day State Visit on 28 September 1966, hoping to get more money to finish the project. But instead of finishing the railway, the money was spent to upgrade the existing Maharlika Highway, sometimes called the Japan-Philippine Friendship Highway. Consequently, although much of the heavy equipment had already arrived, including the tunnel boring machinery for cutting the nearly 10-km Caraballo Tunnel (the extension line was to reach its highest elevation inside the tunnel at about 500 m above sea level) the heavy equipment was sold to alleviate PNR's poor financial conditions.

In an interview, political economist Alejandro Lichauco said that many major industrial projects including the Jacinto

Steel Mill in Iligan City were suddenly in financial trouble. In his 1998 book on the Asian Currency Crisis, Lichauco points out that by 1964, more than 1000 factories were having serious money problems. There was a clamor for restoration of import and currency controls and Macapagal's apparent refusal to listen caused his downfall in the 1965 elections against Marcos.

Ignoring the calls of Congress, Marcos continued Macapagal's policy of economic liberalization. In 1970, the peso was devalued again under IMF-imposed loan conditions. By February 1970, it had sunk to P5.50 to the US dollar reaching P7.90 by June 1981. Today, it is stable at around P40 to the dollar.

As the country prepared to emerge from IMF supervision in 1997, Lichauco says it was, 'the region's debt-ridden economic paraplegic, a once young and roaring tiger, or at least a growling tiger cub, reduced to a decaying vegetable. The Philippine economy, like its politics, has been reduced to an absurdity, which would be comic were it not for the national tragedy and immense human suffering which that absurdity has brought about.'

Lichauco says that an expanded rail network is 'vital' to development. 'Anything that would bring down the cost of transport will help to do that.' However, he adds that, 'a joint venture with the government is the only way it can be built [in the Philippines].' He believes that the government must abandon privatization as it relates to public transport. At present, he sees no basis for recovery, because what little manufacturing activity remains in the Philippines is being eroded. The current economic troubles besetting the country could get worse.

---

### Where Things Stand

---

The people at NEDA are not encouraging if studies released as late as 1995 are

accurate indicators. The working relationship between NEDA and the Regional Development Councils (RDCs) is an important link in economic planning. The RDCs identify projects addressing vital needs across the country. However, if those projects do not match the agenda prepared by the national government—meaning the President and his closest advisors—those projects are not funded or implemented. This is the top-bottom approach to economic planning, where projects are studied at great expense to the Filipino taxpayer, but very little gets accomplished. This situation has been described as 'analysis paralysis.' By contrast, Mr Jimenez says, 'Build the line and economic development will follow.' American railroad expert John H. Armstrong agrees. Citing the US experience, he wrote, 'It became clear that a railroad could be built to go just about anywhere. With this wide-open choice, the real question became one of economics; railroads should be built where *there was, or reasonably could be expected to be* (my emphasis), enough demand for transportation to support the line and pay back the cost of building it. Prosperity and people usually *followed* (his emphasis) rather than preceded the coming of the railroad, so faith and luck were important too.' The Region 2 Council has studied the project since 1992, hoping to revive it.

Meanwhile, the picture is a little brighter in the Philippine Congress. There are now at least seven bills pending and one House Resolution addressing the need to rehabilitate and expand the railroad network in northern Luzon. Of particular interest is House Bill 801, proposed by Representative Edgar R. Lara of the Second District of Cagayan, and a majority member of the House Committee on Transportation and Communications. The explanatory note says 'This bill aims to create the Cagayan Valley Railways Authority (CVRA) which shall provide for

an adequate, cost-effective and dependable transportation system between Cagayan Valley and Metro Manila.' If passed into law, CVRA would be a government corporation with a 50-year life, renewable after that period. Located in the Cagayan Valley itself, it would receive its authority from the DOTC with funding by an IPO valued at P1 billion (about \$20.60 million). Congressman Lara believes a separate agency needs to be created due to the size of its operation and to maintain a distinct regional corporate personality in the Valley.

To overcome the very serious financial situation of PNR, there are calls to privatize the system and reduce the scope of its operations. Under one proposal, PNR would become strictly a commuter service, helping to relieve traffic congestion in Metro Manila. The now-abandoned North Line would be taken over by North Rail, an existing government entity. The rehabilitation will be to standard gauge, although PNR now runs on narrow gauge. Perhaps the best reason for finishing the Cagayan Valley project was created on 24 February 1995 when the Cagayan Economic Zone Authority (CEZA) Act became law. Like the proposed CVRA, CEZA is a government corporation that is responsible for development of a special economic zone and freeport, like the Subic Bay Freeport. The Conceptual Master Plan, including a railroad component, is complete and has been submitted to the CEZA Board of Directors. Aside from acquiring land for a dedicated 6.5-km right of way connecting the Port Irene seaport and air cargo terminal, there are no plans to build a railroad during the first 15-year phase of the Zone.

Meanwhile, Region 2, which is outside the zone, has the second lowest road density in the country. CEZA's Final Report recognizes this challenge by saying, 'Due to this perceived lack of efficient road systems, the region has difficulty attracting private sector investments because of



*The rails have long since been removed by scavengers on this bridge in Plaridel, Bulacan on the abandoned line from Balagtas to Cabanatuan. Plaridel is about 12 km from Balagtas. (Author)*

problems assuring reliable transportation, power, communications, and other support facilities.'

North Rail's route south of San Jose would use PNR's abandoned Tarlac branch line to Muñoz, Nueva Ecija. The Balagtas–Cabanatuan branch line from the south, which is also abandoned, would be restored and a new line would fill the 26-km gap between Cabanatuan and Muñoz. This route bypasses Tarlac and brings the Zone and Cagayan Valley 16 km closer to Metro Manila.

Transport planning within the Zone revolves around the Global TransPark concept (GTP), developed by Dr John D. Kasarda, Director of the Kenan Institute of Private Enterprise, University of North Carolina, USA. It integrates the various elements of successful industrial estates with an efficient multi-modal transport system providing just-in-time services. Port Irene, an intermodal rail facility and air cargo terminal would create an efficient and seamless supply chain for investors and businesses within the Zone. The centerpiece of the system is a new regional airport with international capability. A 1982 feasibility study by the Japan International Cooperation Agency (JICA) on Port Irene's development was generally favorable, and Port Irene will be

upgraded to international standards. When CEZA is fully developed, it will bring five of the Philippines' ten leading trading partners (Hong Kong, Japan, South Korea, Taiwan, and the US) much closer to the Philippines. The advent of the container revolution offers another exciting business chance for the railroad.

---

### Conditions to Keep in Mind

---

Five conditions must be kept in mind to complete this long-overdue project:

- Power supply  
Region 2 has a low annual growth in demand for electricity of 7%. In September 1999, National Power Corp. generated 52.8% of the power on Luzon from oil-fired plants, 13% from hydro plants, and 13.7% from geothermal plants. If the railway can be powered by a reliable electricity supply, it would contribute greatly to making trains environment friendly.
- Currency risks  
Track and rolling stock are not manufactured in the Philippines and must be purchased overseas in US dollars, meaning that currency risks must be factored into any loans, etc.



Tourism to the world-famous Banawe Rice Terraces is the main reason for building the Ifugao branch line to Banawe.

(Quintin Pitoy, Philippine Dept. of Tourism)

- Weather  
From 1948 to 1997, 55 typhoons hit Cagayan. The region's annual average rainfall is 2036 mm and it rains 144 days each year on average. These weather conditions impose severe construction standards on track structures.
- Earthquakes  
The proposed railroad lies between two active earthquake faults. A 1990 paper by the Philippine Institute of Volcanology and Seismology warns, 'We should also accept the fact that, since earthquakes of [Richter] magnitude 7 or more have also affected the Philippines in the recent past, the

likelihood of destructive earthquakes occurring again in the future is indeed very strong.' A Richter magnitude 7 earthquake causes considerable damage to structures near the epicenter, so the track structures will need to be earthquake resistant.

- Political will  
Does the Estrada Administration have what it takes to make decisions and implement programs? President Estrada has acknowledged the role transport can play in poverty alleviation. In his second State of the Nation Address last July, he was less specific about its role. Committee appointments to the House Subcommittee on Railways are still

incomplete. Removing and relocating squatters along the right-of-way poses a significant challenge to local, regional and national politicians.

---

### Future Vision

---

Here is one vision of railroads in the Cagayan Valley based on several concepts from diverse sources. Envision a regional system smaller than the 856-km network of JR Shikoku in Japan based on an operational framework like the US Wisconsin Central Railway—a company with overseas business interests. The CVRA would employ about 2900

employees and would operate a 467-km main line with at least three, possibly four, branch lines. A secondary main line would follow the north coast of Luzon, providing a rail link with the Ilocos region to the west.

The plan for the main line (Cagayan River Route) closely follows the 1980 revision of a plan first prepared by Pacific Consultants KK of Tokyo in 1970 for the PNR but shortens both the main line and Caraballo Tunnel. Another main line route was first mentioned by the late Manuel Vijungco of the University of the Philippines Law Center; an advisory body to Congress. The rationale behind the second route, which is to the east of the original, was that there would be competition from the Maharlika Highway. However, parts of this so-called Sierra Madre Route are prone to flooding.

The branch lines were not included in the Japanese plans but have been added to make the system regional by linking all the provincial capitals. Strictly speaking, the Kalinga and Ifugao branch lines to Tabuk and Banawe, respectively, are not now within the administrative structure of Region 2, but they still have a geographical kinship with Cagayan Valley. Social, economic, and law and order are the main factors behind three of the branch lines. Supporting tourism is the purpose of the Ifugao branch, which would serve the world-famous Banawe Rice Terraces. On the short line to Amulung, practical realities may overrule political considerations and it could be added later. The total track length would be a little less than 648 km. Freight to and from the Cagayan Economic Zone would be a main source of railway revenue. Most freight would be containerized moving on eight container trains each day. Local freight trains would serve the branches and secondary main line. Container services could also run to the Ilocos region.

A variety of passenger services ranging from local commuter trains to comfortable

long-distance expresses would popularize the railways with a minimum of 32 services each day. The fastest expresses would cover the main-line distance in a little under 6 hours with another 4 hours to Metro Manila from San Jose.

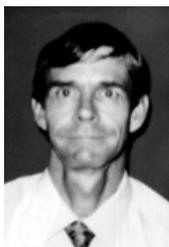
Both passenger and freight operations would go a long way toward fulfilling a possible CVRA vision statement of becoming Region 2's leading transport provider.

But this is a vision of what the Cagayan Valley could be, not what it is. At present, there is no heavy industry, no large-scale agri-business and no world-class port. I imagine the valley when it's being supported by a well-maintained and operating railway system.

The American, Japanese and, to a limited degree, even the Philippine experience, shows that a railway usually has a positive economic impact on the areas it serves. As a writer who has become a more enthusiastic proponent of railways in recent years, I'm encouraged by the words of the noted American architect Philip Johnson, 'Architecture is too important to leave to architects.' Likewise, I believe that railways in developing countries are too important to leave to railway civil engineers, regional and urban planners, and government officials. ■

### Dedication

To the memory of Lope M. Padiernos, engineer and railway consultant, who died at aged 71 while this story was being revised. He was a valuable source of information.



### Gary L. Satre

Mr Satre obtained a Masters degree from the University of the Philippines after working as a US Navy journalist. He is an Associate Trainer at the South East Asia Speakers and Trainers Bureau of Makati City. He also writes and speaks on railroad issues in the Philippines. He contributed an article on the Metro Manila LRT system in *JRTR* 16, pp.33-37.

### Acknowledgments

I wish to thank the many people who provided information for this article, including: Dr A. G. Cruz, Professor R. S. David, Mr E. O. Enriquez, Ms E. R. Aborod, Ms Fely E. Gica, Engineer R. J. Jimenez, Dr L. Q. Liongson, Mr S. Navarro, Dr E. G. Ramos, Mr R. Rimando, Dr R. Sigua, Ms A. Shari Tan-Aliman, and Engineer C. O. Giron.

### Notes:

1. John H. Armstrong, *The Railroad—What It Is, What It Does. The Introduction To Railroadng*, Simmons-Boardman Publishing Corp., 1978.
2. James H. Blount, *American Occupation of the Philippines, 1898-1912*, Putnam's Sons, 1913.
3. Arturo G. Cruz, *Railroad and Regional Development in the Philippines: View From the Colonial Iron Horse, 1875-1935*, Cornell University, 1989.
4. Glaudio O. Giron, *What Is Brownout? — Luzon Grid Power Crisis and System Operations*, Giron Enterprise, 1993.
5. Vanessa Jane Glynn, *Railroad Policy and Administration in the Philippines in the American Period, 1898-1924*, University of the Philippines, 1987.
6. *Earthquake and Tsunami*, Philippine Institute of Volcanology and Seismology, 1990.
7. Maximo M. Kalaw, *The Development of Philippine Politics, 1872-1920*, Oriental Commercial Co. Inc., 1926.
8. Leonardo Q. Liongson, *At the Heels of the Industrial Revolution: Filipino Responses to 19th Century Infrastructure*, University of the Philippines, January 1998.
9. Rosalinda Pineda-Ofreneo, *The Manipulated Press — A History of Philippine Journalism Since 1945*, Solar Publishing Corporation, 1986.
10. *PNR: The First 100 Years*, Philippine National Railways, 1987.