
THE INTRODUCTION OF RAILROADS TO CHINA:
THE OBSERVATIONS OF
WILLIAM BARCLAY PARSONS

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In 1898, William Barclay Parsons, a US engineer who later became known as the designer of the original New York subway, went to China. He went at the request of a US syndicate (American China Development Company) backed by King Leopold of Belgium, US banker J.P. Morgan, and two US Senators to survey a railway concession granted by the Chinese government. Today a major north-south trunk line, its 1,050-kilometer route (650 miles) was to run north from Canton (in Kwangtung Province and China's principal southern seaport), across Hunan (a province closed to foreigners), to Hankow (in Hupeh Province). (See Figure 1.)

After completing his survey, Parsons returned home in 1899 to design his subway and to write a thoughtful book on his Chinese experience, *An American Engineer in China*. This book today gives us a look into the attitudes and concerns of a western engineer approaching an international development project at the turn of the century. Also on his return, he resumed development of the consulting firm he had founded; today, as Parsons Brinckerhoff, Inc., it still bears his name and is the US's largest provider of transportation engineering services.

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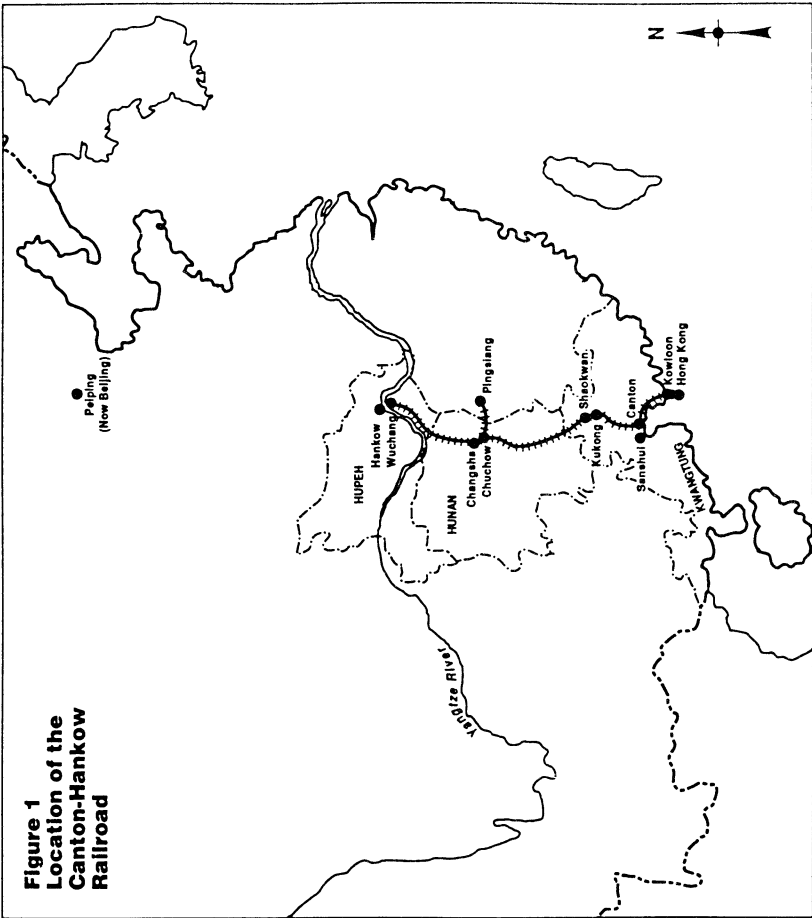


Figure 1
Location of the
Canton-Hankow
Railroad

PARSONS
BRINCKERHOFF

My interest in Parsons' trip to China stems from-

- ▶ A desire to get beyond the project planning focus of US environmental impact assessments and begin to build a better understanding of the possibilities that environmental impact assessment offers to regional, national and global development and environmental planning.
- ▶ An interest in origins and the circumstances and decisions that have led us to where we are today.
- ▶ A belief that the best starting point is where you are, in my case an employee of the engineering firm Parsons founded.

This paper is written from the perspective of a preparer of transportation project impact assessments. It is based on Parsons' 1900 book documenting his trip to China and the observations on Chinese life, commerce, finances, communications, and railways that it contains, and on supplemental readings on railroads in China. The purpose of this paper is not to reach particular conclusions about what should or should not have been done in turn-of-the-century China or what should or should not be done in developing or developed nations today, but rather to present an interesting story and let it speak for itself.

INTRODUCTION TO PARSONS

According to interviews and letters quoted in the centennial history of the company he founded, Parsons was a visionary who once declared, "Of all human activities, engineering is the one that enters most into our lives. " He approved of Thomas Telford's definition of engineering as "the art of directing great sources of power in nature for the use and convenience of mankind," but added, "There must be a background of culture to produce the mental poise necessary to accomplish such a tremendous task" (Bobrick, 1985).

China, however, was not in Parsons' original vision. Parsons once told a journalist that the reason he had, back in 1885, opened his office as a consulting engineer "was to make himself available for what he had already

decided was to be his life's work: the building of a subway for New York" (Bobrick, 1985). But Parsons' cherished New York project stalled in the financing stage. In this gap, as it happened, some financiers backing the New York project came to be among the holders of a newly granted concession from the Chinese government for the proposed Canton-Hankow railroad line, and they approached Parsons to use his time to survey the route. When asked to go to China:

He didn't need much persuading. He was in a restless--possibly reckless--state of mind. The subway plans on which he had labored for more than a decade remained at the mercy of Albany [capital of the State of New York] intrigue, which dragged interminably on; and he was doubtlessly growing weary of the pitying commiserations of friends. He accepted the assignment with alacrity--even though, he told his friend Nicholas Murray Butler, he was "confident/y informed he would be killed" (Bobrick, 1985).

Parsons saw the assignment as belonging to a cycle of world history. He wrote, "the world's progress has always been from the rising to the setting sun *ex oriente lux*." In addition, he "prepared himself with a study of Chinese history, philosophy, and the classics, regarded talk of the 'Yellow Peril' as perverse, and took pains to remind his compatriots that however backward the people might presently seem, their heritage was second to none. ..." (Bobrick, 1985). Regarding the Chinese people, he stated:

In thinking of the Chinese, especially those in the interior, we are wont to consider them as uncivilized; and so they are, if measured scrupulously by our peculiar standards. But, on the other hand, they might say with some justice that we are not civilized according to the standards that they have set for themselves, founded on an experience of four thousand years (Parsons, 1900).

PARSONS' VIEW OF RAILROAD NEED AND IMPACT

Parsons assignment was to survey the route of the Canton-Hankow railroad. Preparation of an impact assessment was in no way a part of his assignment

nor, I suspect, even conceived of by Parsons or his American sponsors. Yet Parsons did not just survey the route, turn in his results, and move on to other tasks. That he chose instead to spend some months of his own time writing and publishing his thoughtful past-return book suggests that he viewed the project not merely as steel rails connecting two destinations, but as a cultural turning point worthy of public awareness. Though without the vocabulary of "impact assessment," Parsons seems to have felt an obligation to place such a construction in a cultural context. He believed that a need existed for improved transportation in China and that transportation improvements would benefit the lives of the Chinese and be of benefit to the United States and Europe.

Purpose and Need

Parsons' observations on the purpose and need for railroads in China can be summarized as follows:

- ▶ Improve accessibility to the interior.
- ▶ Provide the opportunity for China to develop untapped natural resources.
- ▶ Increase trade, as a result of the first two items.
- ▶ Overcome Chinese inaction on the first two items

Improved accessibility

The need for improved accessibility that was seen by Parsons reflected his thoughts on the limits of Chinese water and land transportation in the late 1800s, including unimproved rivers, limited use of vehicles for land transportation, and narrow and poorly maintained roads. In addition, the principal source of power was human labor.

River Transportation. At the time of Parsons' visit, China's principal means of trade, transportation, and communication in the interior was its rivers and waterways. Parsons observed, however, that the Chinese had made little attempt to make their rivers more navigable by removing bars and other natural obstacles and deepening channels. Improvements to rivers and maintenance of those improvements would have required a united effort by river users. Parsons noticed no incentive for river users to join and make

such an effort. Instead, the Chinese had adapted their craft and their mode of operation to river conditions and accepted the losses of time and the expenditure of human energy necessary to overcome the natural limitations of river travel. Junkmen could take weeks and perhaps months to move a cargo a few hundred kilometers (Parsons, 1900).

Land Transportation. Regarding land transportation, Parsons observed, "Arduous, however, as is the task of transporting goods . . . by means of river navigation, it is nothing compared with the labor required to deliver them at a destination removed from the water-way" (Parsons, 1900).

At the time, the vehicle of land transportation varied by region. In central China, the vehicle for land transportation was the wheelbarrow. Parsons described this vehicle: "the wheel is large, being about thirty inches in diameter, with the body of the vehicle balanced on the axle, and on both sides of the wheel. " These vehicles were used for both passengers and freight. As one approached southern China, the wheel got smaller and farther forward until use of the wheelbarrow disappeared entirely. The rich or official Chinese used a sedan chair. The greatest part of China's commerce, however, was carried in two baskets suspended from a bamboo pole resting on the shoulders of a man at up to 100 pounds a load (Parsons, 1900).

In Parsons' time there was no central authority responsible for highways. Land owners were reluctant to give up the land needed for roads. Thus, roads wound through the fields and were barely wide enough for two men to pass. Although in some cases they were paved with stone, roads were poorly maintained (Parsons, 1900).

Development of untapped resources

As he passed through China, Parsons saw what he viewed as large areas of untapped natural resources. He felt that these resources could be developed for internal use and for trade with other nations if a means existed to transport them to market. He observed-

- A great amount of land lying fallow and untilled that he believed was capable of producing crops of various kinds. In addition, China's variety of climates across its vast area meant that China possessed the ability to produce any type of crop. The great

bottom lands of its rivers were subject to annual overflow and thus were naturally fertilized. The soils of its Great Plain were of extraordinary fertility.

- ▶ Unused hillsides that could have been used by grazing animals and other hillsides that were capable of supporting forestry.
- ▶ Vast mineral resources that were nearly untouched. China's greatest wealth lay in coal and iron. China had coal fields exceeding those of Europe, yet China was importing coal. There were also undeveloped beds of copper, iron, lead, and silver.

Increased trade

Parsons observed, "Foreign trade in China today is confined exclusively to the treaty ports located along the coast and up the Yang-tze." In those days, the importer sold his goods to Chinese merchants at the treaty ports, who sold the goods in the interior. Parsons believed that the success of a commercial invasion of China was dependent on directly reaching the great Chinese population in the interior, a population "out of reach of existing means of transportation" (Parsons, 1900). He also reasoned that transport taxes collected, both those applied along trade routes in the interior and import and export duties collected at Chinese ports, would rise with increased trade.

Overcome inaction

Parsons viewed the railroads as the sole hope for beginning a change in Chinese transportation. He did not expect any action could come from the "great mass of Chinese inaction" because-

- ▶ The education of those highly educated was one focused on the teachings of Confucius, who lived 2,500 years ago, and not on the teachings relevant to the 19th Century AD.
- ▶ The Chinese of the time owed their first allegiance to family, then to the state or province. A sense of national patriotism was lacking. Parsons saw flags of all types, but never a national flag.

- ▶ The great engineering progress of China was “along static rather than dynamic lines. . . .” They had learned how to build bridges and erect pagodas, “but not how to construct a machine, or to do any of the things the basal principle of which is *movement*” (Parsons, 1900).
- ▶ China’s past lack of organized cooperation to improve water and land transportation (as described above) convinced Parsons that it would be easier to build railroads on the banks than try to improve the streams.

For the above reasons, Parsons saw the development and maintenance of a railroad system by foreigners, in which the Chinese would pay only for services rendered, as the sole hope for the improvement of Chinese transportation.

At the time of Parsons’ visit, concessions had been granted to foreigners by the Chinese government for 9,150 kilometers (5,680 miles) of railroad. This included 450 kilometers (280 miles) that had already been constructed and 1,024 kilometers (636 miles) under construction. There was also an 860-kilometer (534 miles) Chinese government “metropolitan district” system. In general, the agreements with foreign governments stated that the property used belonged to the Chinese government and the money required for construction was advanced by the foreigner as a loan backed by government bonds. The foreigner, however, had financial control and control related to local interests. After the 40- to 50-year concession and upon repayment of the loan, the Chinese were to take over management (Parsons, 1900).

Impact

Parsons described five social impact-related issues surrounding the building of railroads in China:

1. Loss of jobs for traditional carriers in the interior
2. Loss of power by officials
3. Readiness of the people to adapt their lifestyle to a significant change in accessibility

4. Disturbance of tradition
5. The railroad's future value as an asset

He did not raise the question of environmental impact.

Loss of jobs

At the time, advocates of railroads believed they would “enrich the people”; opponents said they would be more likely to “impoverish the people,” local officials objecting that coolies and junkmen would loss their jobs. In fact, officials predicted that they would end up starving in ditches, gather as outlaws, or rebel (Huenemann, 1984). Parsons, however, pointing to the experience of other countries, believed that railways would increase employment at higher wages by “diversifying and developing new means of trade” (Parsons, 1900).

Loss of power

It was Parsons' opinion that opposition to railroad construction in China had largely come from the official class, which felt that such a change would lead to the general enlightenment of the country and a reduction in their power and prerogatives. In his monograph, *The Dragon and the Iron Horse*, Huenemann (1984) likewise noted that the social position of the gentry and officials was tightly linked to the preeminence of Confucianism. Further, as noted above, there was concern that unemployment would lead to rebellion, as it had in the past in China. And finally, there was worry at the time that the railways might provide a convenient path for invasion. Conversely, though, others said that railroads would permit transport of raw materials for arsenals and better Chinese troop mobility (Huenemann, 1984).

Readiness to adapt

In village shops, Parsons saw goods displayed from the US, Europe, and elsewhere in the Far East, even in provinces that had seen few Westerners. He observed the use of electricity in Changsha, the capital of Hunan and a place known for its avoidance of potential “foreign contamination.” He took these signs as indications of Chinese willingness to adopt foreign ways and

preparedness to **make the greater changes in life that would become possible with the introduction of railroads.**

Disturbance of tradition

Huenemann (1984) reported concern that the railroads might disturb the traditional folk practices of the common people by leveling graves, razing cottages, trampling fields, and damming up wells. And Parsons (1900) observed that ". . . every district has its sacred hill or holy river wherein lies the spirit of the local protecting deity which, if interfered with, dreadful disaster will result." Parsons also noted that graves of ancestors were the most important outward evidence of Chinese religion. "They were not, however, grouped in cemeteries but scattered across the face of the country; it was impossible to build a railroad without interfering with them.

Valuable asset

Arguments raised by the Chinese against the potential profitability of railroads in China included (1) inability of the poor to buy tickets, (2) small volume of freight that could potentially be moved, (3) property would be a target for thieves, and (4) railroads would carry a heavy debt burden (Huenemann, 1984). But from Parsons' perspective, through the use of foreign loans and concessions, China stood to gain both rapid development and, in the long term, ownership of a railway system. For this the government's liability was limited to 5 percent interest that was to be paid from railway profits. He acknowledged, however, that the government did risk foreign promoters' not sufficiently considering need or earning power and that the Chinese should approach these foreign agreements cautiously. He also noted that some railway projects in China "have been prompted undoubtedly much more by foreign politics than commercial motives. "

WHAT ULTIMATELY HAPPENED

Construction of the Canton-Hankow Railroad

Parsons found the engineering difficulties to be considerable and the loan to build the Canton-Hankow railroad was approximately doubled after his survey in order to cover increased costs and three additional branches in

Hunan province (Chang, 1943). As with many a development project since Parsons' day, however, it proved one thing to plan the Canton-Hankow line and another to build it. As described below, control of the concession and the source of financing changed several times. The line was built in segments and was not completed until 1936. After so long a wait, its first moment of full service was brief: with the Japanese advance into China during World War II and the fall of Hankow and Canton in 1938, the Chinese set about dismantling hundreds of kilometers of the line-after only two years of full service! Not until 1952, under a rail restoration program conducted by the communist government, could the railroad Parsons surveyed in the 1890s be called in permanent operation.

Under the Americans, only two short branch lines were built-the 48-kilometer (30-mile) Canton-Samshui railway and the 900 kilometer(56-mile) Chuchow-Pingsiang railway. The Americans' agreement with China stated that the rights to the concession could not be transferred to other nations. But in 1898, construction rights for the Peiping-Hankow Railway had been granted to a Belgian syndicate that in reality represented French and Russian interests. In fact, Belgian financiers bought enough shares on the open market to give them a controlling interest by the end of 1900. By 1903, the Belgian takeover of the company was increasingly overt (Huenemann, 1984) and Chinese officials felt Belgian control of the Canton-Hankow line risked complete control by the French and Russians of trunk lines from Peiping (now Beijing) to Canton. Voices were raised to annul the American agreement. Finally, J.P. Morgan & Company bought back the Belgian shares and the Chinese government bought out the American interest in 1905. A British bank loan was used (Chang, 1943; Huenemann, 1984).

Provincial railroad companies were set up in Kwangtung, Hunan, and Hupeh provinces to continue construction. Factionalism, corruption, and mixed interest by Chinese investors resulted in only 81 kilometers (50 miles) being built in Hunan province. The Hunan and Hupeh companies were nationalized in 1913 and 1915, respectively. With a foreign bank loan, the northernmost 418-kilometer (259 miles) section of the railroad was finished in 1918 (from Wuchang, just south of Hankow, to Chuchow). The Kwangtung province section remained a locally financed line and was carried as far from Canton as 224 kilometers (139 miles), to Shaokwan, by 1915. This activity left a 406-kilometer (252 mile) section in the middle (between Chuchow and Shaokwan) incomplete (Huenemann, 1984; Chang 1943). In addition, a

bridge across the Yangtze River between Hankow and the northern end of the line at Wuchang was not built until after World War II (Chang, 1943).

The 406-kilometer (252 mile) gap was not filled until 1936. Bonds were sold, with the Hong Kong and Shanghai Banking Corporation (British) and the Bank of China sharing the issue equally. Construction began in 1930. Also at that time, the northern and southern sections, which had already fallen into a state of disrepair were improved, and the bridges were strengthened (Chang, 1943).

In the 1930s, the Canton-Hankow railroad served an important role in the shipment of Chinese supplies during China's defense against Japan. Traffic ranged from 80 to 140 trains per day on the Canton-Hankow and Canton-Kowloon (connection between Canton and Hong Kong) lines, although the Japanese tried to disrupt traffic along the line by bombing it 60 to 145 times per month. In 1938, only two years after the Canton-Hankow line was completed, Canton fell to the Japanese and the southernmost 63 kilometers (39 miles) was captured. An additional 155 kilometers (96 miles) was then dismantled by the Chinese. Hankow was also taken by the Japanese and the northern 266 kilometers (165 miles) was lost. The Chinese removed rails and destroyed the bridges for another 150 kilometers (93 miles) (Chang, 1943).

By December 1942, the entire 634 kilometers (393 miles) of the northern and southern sections of the Canton-Hankow line, including the 48-kilometer (30-mile) Canton-Samshui branch line, had been torn up on account of war operations and would have to be rebuilt. Only the middle 463 kilometers (287 miles), between Chuchow and Kukong, remained in free China and in operation. Rails from dismantled railroads were used to build new or replacement lines (Chang, 1943).

The Canton-Hankow line, viewed as an important north-south trunk route, was ultimately restored by the communist government between 1950 and 1952 as a part of the repair and rehabilitation of some 1,742 kilometers (1,080 miles) of railroads (Leung, 1980).

IMPACT OF CHINESE RAILROADS

Railroads proved to be a mixed blessing for China. Many of both the positives and negatives noted by proponents and opponents came to pass. In addition, the impact of the railroad appears to have been closely tied to external factors, including: foreign financial interests, changing governments and government priorities, and war and revolution. The positions and focus of historians varies widely. The following paragraphs present a few observations from the literature that address the five social impact-related issues observed by Parsons.

Loss of jobs

As predicted, there was some technological unemployment of transportation workers (Huenemann, 1984). Except for junks, no means of transportation could give cheaper rates than the railroads, but steamships and junks were able to compete (Wang, 1984). On the other hand, much of the rail traffic was new traffic; for example, coal traffic was new traffic and new jobs in the mining industry were created (Huenemann, 1984).

Loss of power

The boom in railroad building in China between 1897 and 1912 corresponded to the Boxer episode in 1900 and the collapse of the imperial government in 1912. The railroads helped both the Chinese and invaders during war. During the Boxer episode in 1900, the Boxers tore up the rails so that the railroads would not help the allied armies countering the Boxers (Huenemann, 1984). During World War II, military success was directly related to the control of important railway lines (Leung, 1980). As noted earlier, the Canton-Hankow line proved valuable to Chinese military operations, but was partially dismantled so it could not be used by the invading Japanese. Components of dismantled railroads were used to build new railroads in the rear. The Japanese improved captured Chinese railroads to increase their usefulness (Leung, 1980).

Readiness to adapt

Changes in foreign trade had a very close relationship to the presence of the railroads, including increases both in exports of minerals and agricultural

products and imports of manufactured goods (Wang, 1984). The penetration of foreign manufactured goods, however, contributed to the collapse of cottage industry and the rural economy (Leung, 1980). In addition, the increased prices of products that could be exported were a problem for local consumers (Huenemann, 1984).

Disturbance of tradition

The railroads changed transportation routes and thus community size (Wang, 1984). Towns on the railroads grew, while trading centers along traditional land routes were impoverished. And development was accompanied by changes in lifestyle that reflected new wealth. A survey of the areas on the Peiping-Hankow railroad in 1934 revealed a wide difference in living standards between the developed north and impoverished south (Wou, 1984). Yet in times of emergency or disaster, the railroads made possible the prompt delivery of food or moved victims to new locations (Wang, 1984). The railroads also stimulated the migration of the Chinese, as people moved temporarily and permanently to other parts of China for work (Wang, 1984).

The Imperial Railway resolved the problem of scattered graves by using the expedient solution of paying families compensation in excess of the cost of grave relocation. Opposition practically ceased and enterprising families that did not have an ancestor in the way would borrow those of neighbors and quietly re-bury them in the planned railroad right-of-way. Even after paying the second party, a profit could be made (Parsons, 1900).

Valuable Asset

Railways built with foreign loans were frequently higher in cost, financially unsound, had higher operating costs, and were not in the most commercially desirable location. Many of the railroads were in serious financial difficulty for many years (Leung, 1980). The development of traffic was impeded by shifting the railroads into regional spheres of interest (Huenemann, 1984). However, first the imperial government, then the republican government, and then the communist government all viewed railroad building as important. Today the railroad is the basic system of transportation in China, carrying the bulk of freight and passenger movement (Leung, 1980).

CONCLUDING PERSONAL REMINDERS

I must confess that I was a little disappointed, though not entirely surprised, in how the story of the railroad Parsons surveyed turned out. For me, a more satisfactory ending would have included the quick completion of the line and its proving to be both a financial and social success. Instead, the building of the Canton-Hankow railroad became embroiled in the same political process that gave it its start and, as predicted, railroads in China proved to be a mixed blessing. None of this surprised me unduly, because I, too, have participated in several projects that were never built because the political circumstances under which they began changed.

Although it is not the intent of this paper to reach particular conclusions about the actions taken in turn-of-the-century China or in developing or developed nations today, this study of Parsons and railroads in China yielded for me, a preparer of transportation project impact assessments, four reminders of lessons we should not forget:

- ▶ Know the culture.
- ▶ Policies, as well as projects, have impacts.
- ▶ Facilitate good decisions.
- ▶ Keep the vision.

Know the Culture

I was impressed by Parsons' efforts to understand and appreciate the Chinese culture, as reflected in his book about his journey. I was reminded again of how widely impact assessment issues and the weight they have in decision making vary from place to place, even within my own country. On a project in western Georgia, I found that the issue was highways versus farmland preservation; in Lansing, Michigan, the issue was serving the needs of traffic generated by new development versus peace and safety in existing neighborhoods; in the Yukon Territory, Canada, the issue was the social impact of introducing a thousand mostly male construction workers to an area with a population of about a thousand; and in Dallas, Texas, light rail transit was important to the city's future as long as it was not near one's home.

I have stopped being surprised at how easy it is to forget this lesson. For example, in the US, the relocation of a few homes and businesses is generally not considered a significant impact since the fair market value is paid for properties and relocation assistance is provided. Yet, on a recent project, I met some people who found the need to move, even a short distance, a horrifying prospect.

Policies, As Well As Projects, Have Impacts

The introduction of the railroads changed transportation in China and the lives of many people. Whether these changes helped or hurt was a matter of debate before the railroads were built and is a matter of debate today. For Parsons, the positive would outweigh the negative. This was the conviction of some Chinese officials, and the opposite was true for others. The experience of China and railroads reminds me that impact assessment has a role to play in policy making, as well as in project development. In the US, we might find better answers if we ask "what transportation system best balances development, social, and environmental objectives?" **before we ask** "what is the most environmentally sensitive semilimited-access four-lane road with a 46-foot median?" Country environmental studies, such as the World Bank's Environmental Action Plans, are being used as a means to encourage improved environmental and natural resource management in developing countries (Arensberg, 1992).

Facilitate Good Decisions

There is no doubt that politics played a large role in the development of railroads in China. In Parsons' day and now there are two sides to development planning, the scientific and the political. The one should be systematic and objective and the other is not. On the scientific side are the engineers, planners, social scientists, and the natural scientists who define a proposed development, its costs, and the positive and negative changes it will bring. The need to provide additional funding after Parsons' survey of the Canton-Hankow route found considerable engineering difficulties was a reality that could not be avoided. On the political side are the decision maker and those who seek to influence the weight given to the various trade-offs involved in development decisions. The Canton-Hankow concession was given to the Americans in order to keep the Belgians out. As important as the scientific side is proving to be, it is in the political arena that development decisions

are made. Thus, I am reminded again that an impact assessment should be a decision-making tool. Although an impact assessment can define a need make clear the components of a proposed action, and describe impacts and the means to mitigate them, it should be a document designed to facilitate thoughtful consideration of the trade-offs involved by the decision maker.

Keep the Vision

Parsons was a man of vision. In the field of impact assessment, vision is something that can quickly disappear when a client attributes a misunderstanding to the use of the phrase "take into account" rather than "consider," or argues that commas come after quotation marks rather than before. For me the best part of participation in a professional society like the International Association for Impact Assessment is that it helps me define and keep in view the big picture, the vision that threatens to get buried in the routine.

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