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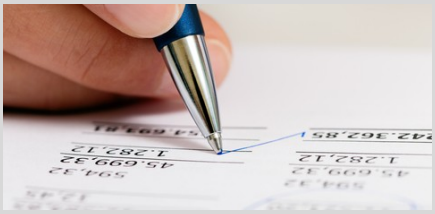
Cover Story

Growing Urbanisation in Pakistan and Civil Engineering Challenges



The Pakistan Civil Engineer

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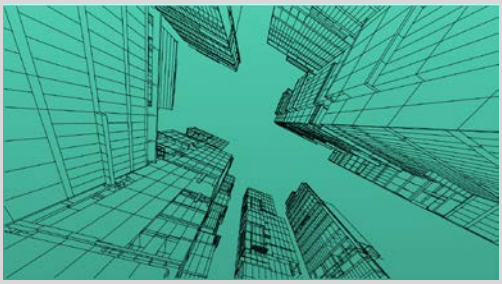


Editorial

This is the third issue of the Pakistan Civil Engineer is here.

We are moving slowly but are steadfastly and continue to look forward to feedback from our potential readers.

We take this opportunity to seek contributions to the Pakistan Civil Engineer, from the valued readers. Without the support of the entire civil engineering community, the magazine would not be able to cover all the varied aspects that need to be covered.

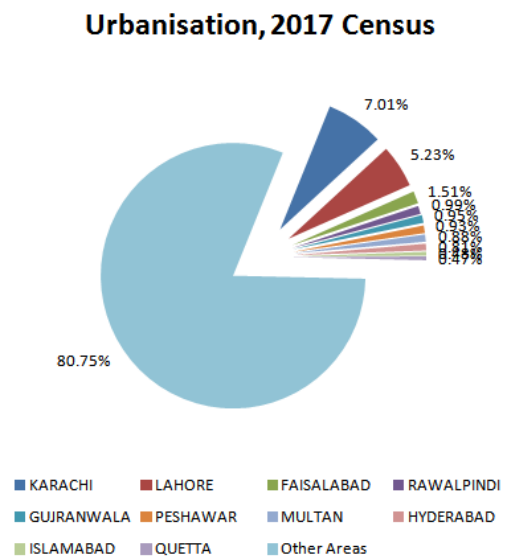
Looking forward to your support,

Rizwan Mirza
Chief Editor

Cover Story

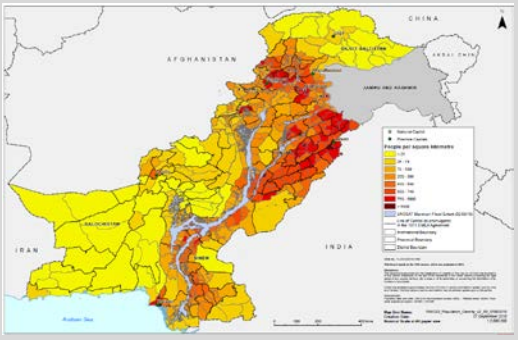
Growing Urbanisation in Pakistan and Civil Engineering Challenges

Rampant trends of growing of urbanisation in the country has increased the civil engineering challenges faced by large cities of Pakistan. The way the poluation of major cities as grown over the past two decades has been depicted in the following figure:



With about one-fifth of the population of the country living in ten cities, the challenge has indeed assumed alarming proportions.

A deeper analysis shows that the actual stuation is worse than what urbalisation figures tell us at a glance. As the country's map (United Nations Office for the Coordination of Humanitarian Affairs, OCHA, 2010), below shows, the human settlemnt patterns of the country, show an extremely uneven polutaion density distribution. The urbanisation trends only further complicate this basic distortion.



The state of preparedness, of the country, in addrssing the alarming urbanisation trends remains

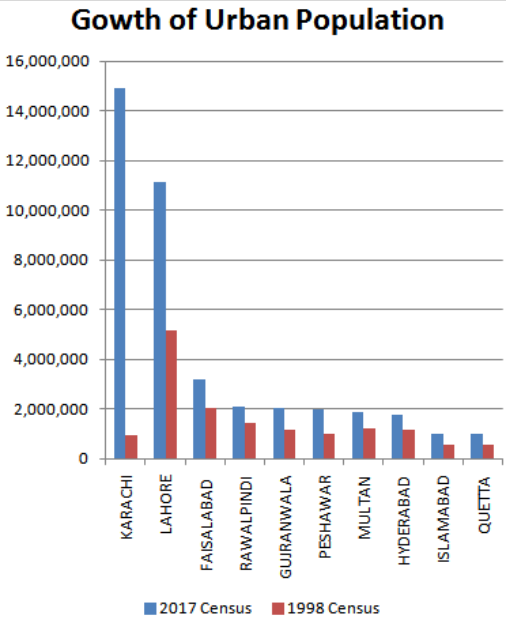
almost non-existant. We are indeed sitting over a demographic bomshell.

> ***As urbanization accelerates, the global urban infrastructure will experience a demand it is not equipped to handle. By 2050, two-thirds of the world's population is expected to live in cities, according to the United Nations Population Division.***

According to UN Habitat, a number of issues are associated with the dynamics of urbanisation:

Society continues to blame engineers for lack of a decisive action on the part of institutions which are expected to make policy decisions.

These demographic changes are posing ever-incrasing and major civil engineerng and city planning challages to the country. The country has so far been responding on an *ad hoc* basis to these challanges.



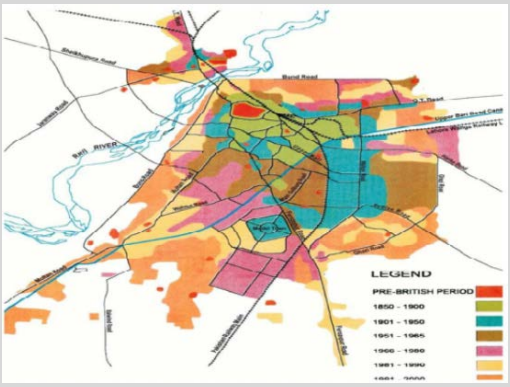
Housing takes the first toll. With widening gap between demand and supply of housing stock, city dwellers are findng residential quarters out of their reach as prices and rents have sky rocketted.

Karachi has chosen to go vertical and has been converted into a concrete jungle of sorts. This has also left a profound social and cultural impact on the city.

Under pressures of increasng housing demand, Lahore has been expanding especially soutwards and aprtially towards the east.

Lahore at the first decade of Twentieth Century

As may be seen below, the expansion towards east has been stalled by the Indian border and that towards the north and west, by the River Ravi.



Transportation poses the next major challenge. With huge current reliance of population on small individual or public vehicles, no easening of situation appears to be in sight. Trip patterns also determine the spatial and temporal traffic flow volumes.

Pressure on water supply, sewerage disposal and stormwater drainage come next. City are dicharging their affluent in streams, thus defiantly violating the national environmental laws.

Aquafer is being seriously effected by drawdown due to continuous pupming for the needs of a burgeoning population. At the same time, water recharge has decreased, amongst other things, due to increase in surface runoff as paved and built-upareas increase as well also due to levelling of ground.

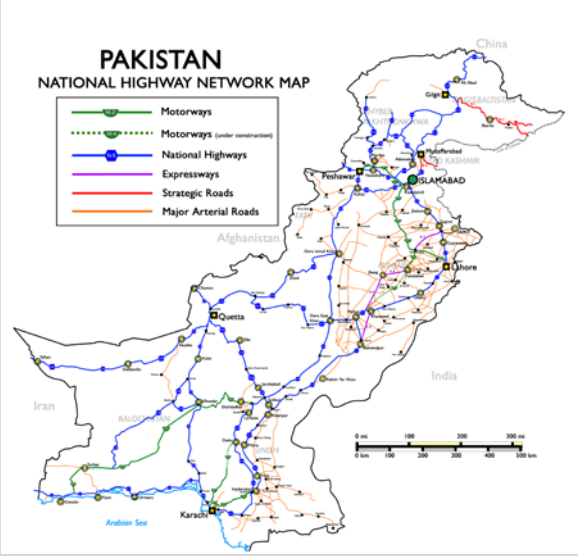
Our cities are thus fast becoming rather hard to manage, if not completely unmanageable. There are issues and questions but litte by way of answer.

Apparently, we need to proceed from whole to the part, in an attempt to converge to a solution. The national-level dcisions – or indecisions – are reflecting in the city-level fallout. We all know that people migrate to cities for economic and social opportunities. But unfortunately the issue is not urabanisation *per se*, but migration taking place only to selected cities, because other cities are not developing.

The logical question woud be why other cities are not growing? This is the moot question and has many facets. The answer has many parts also and some clearly relate to civil engineering.

Let us evaluate the situation in Pakistan. Firstly, certain geographical locations have certain inherent advantages and disagvantages. Karachi and Gawadar remain port cities and no other city can claim this advantage. Islamabad, Karachi, Peshawar, Lahore and Quetta are capitals, which makes them distinct. Access to certain mountainous regions would always remain extremely hard and this would always be a point of diadvatage. These are only extreme examples and, like always, there are many shades of grey in between.

In addition to inherent strengths and weaknesses, it is also an interplay of a number of factors that determines the course of development of a city. Let us take a look at the national transportation network of Pakistan.



As we not , certain areas of Pakistan are directly connected through the main national road netetwork of freeways and arterials, roughly aligned N-E to N-W. There may of course be historic reasons for at least some of these routes. But the fact remains that oppurtunities of development open up only for cities on the basis of the level of transportation connectionsthey have. This is the first point that merits consideration.

But this, alone, does not provide the entire answer. We also know that the growth of a small town is greaty hampered by the presence of a large city located close by.

Of great importanace, also, is the level of infrastructure of a city. This includes roads, electricity, telephone, internet, water suply and sewerage, stormwater disposal , hospitals, educational institutions, markets and government offices, to name a few. It is thus self-evident that if the government selectively directs resources only to certain large cities, even in good faith, those cities would grow further, thus complicating the issue even more. More may not be better in some cases, it seems.

Location of key government offices in the capitals also increases pressures on these cities. Inter-city trip patterns need to be partially modified by locating small coordination offices in all districts which deal with all public issues with disptach and thus eliminate the need for people to travl to the capitals.

Issue of the seats of the various High Courts and the Supreme Court of Pakistam may also be examined on the merits of the civil engineering aspects of the issue.

The entire issue is arguably extremely complex, offering no easy and cut-and-dried answers. This article is also not an attempt to answer all the questions. It is just a wake-up call pointing out the changes that are taking place and raising questions that need to be addressed.

Perhaps no one pays expert attention to the technical aspects of these issues, at the professional level. It is about time that we abandon the policy of knee-jerk reactions and adopt a more proactive long-term and well thought-out human settlement policy, before it is too late.

Law

Dispute Resolution in Construction Contracts

Such is the nature of civil engineering construction projects that there is hardly a construction contract that does not have a potential dispute in its ambit.

Modern forms of contracts provide a number of means of handling such disputes.

The Engineer
The Engineer walks a tight rope of being paid by the Employer, on the one hand, and acting neutrally between the parties to the contract, on the other. Disputed issues are at first referred to the Engineer for what is commonly known as the determination by the engineer. This becomes the first forum of addressing the issues. But in all fairness, this is a forum that may be roughly compared with executive exercise of authority. Accepting or rejecting the decision of the Engineer remains voluntary.

Dispute Resolution Board (DRB)
Some forms of contracts provide for another forum, called dispute resolution board (DRB), for addressing disputes. At the conceptual level, this appears to be an attempt to recognise the well-known dichotomy of the role of the Engineer. The DRB is manned by third parties. But again, accepting or rejecting the decision of a DRB remains voluntary, on the part of parties. As such, it is a forum that provides yet another opportunity for an amicable resolution of disputes, this time keeping the Engineer out of the decision-making process.

Arbitration
If the parties to a construction contract agree, or have agreed, to refer their disputes, or a dispute, to arbitration, the disputes are finally resolved by Arbitration.

Arbitration is undertaken by one or more third-parties. Arbitrators may or may not be engineers, but being an engineer offers more advantages than not being an engineer does.

An arbitrator acts fairly and decides on the basis of the evidence before it. If the arbitrator is an engineer, he is not supposed to use his professional knowledge of engineering, without putting the parties to the dispute on notice about the applicable principles of engineering at the back of his mind, thus providing the parties a fair chance to present their points of view on the record. This makes the arbitration procedure adversarial in its nature.

The decision of the arbitrator is called the arbitration award.

In most jurisdictions, law provides due cover and protection to the arbitration awards and no appeal, lies against the arbitration award, at least not on its merits.

Under the law of Pakistan, the arbitrator is required to provide reasons for his award, but again, no higher forum has the jurisdiction to examine the fairness of the reasons attached.

A competent court of law may be approached by one of the parties for appointment of an arbitrator, if other party to arbitration agreement does not cooperate in the process. After the award has been handed down, one of the parties may request the arbitrator to file the award with the competent court of law for making the award, rule of the court.

The court has extremely limited jurisdiction in respect of awards. Correction of secretarial errors, correction to the extent of decisions made on the issues not placed before the arbitration forum, correction of imperfections, but only if the award is not affected, are the powers enjoyed by the court.

Unless enforcement is voluntarily undertaken by the parties, enforcement of the award is made if the court of law makes the award a rule of the court when requested to do so. The rule of the court may then be treated like a decree and enforced in the same manner.

Litigation
In the absence of an arbitration agreement, unresolved disputes may end in litigation. One or more parties may approach the court of competent jurisdiction for redress of its grievance. Damages or specific performance may be sought under the law. This is often a costly and time-consuming procedure.

Biography

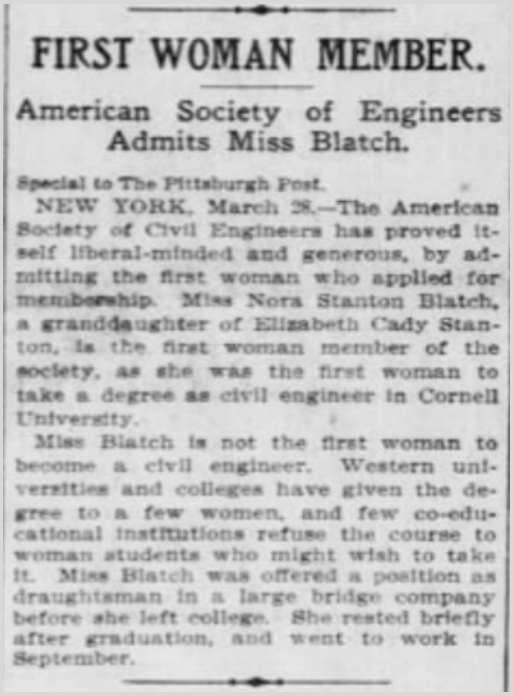
Nora Stanton Blatch Barney – the first female civil engineer

Nora Stanton Blatch Barney, (born 30th September. 1883, Basingstoke, Hampshire, Eng.—died 18th January, 1971, Greenwich, Conn., U.S.), American civil engineer, architect, and suffragist whose professional and political activities built on her family's tradition of women leaders.

Nora Stanton Blatch was the daughter of Harriot Stanton Blatch and the granddaughter of Elizabeth Cady Stanton, both of whom were leaders of the women's rights movement in the United States.

After her family relocated to New York City, Blatch studied at Cornell University in Ithaca, New York, where in 1905 she became the first woman in the United States to obtain a degree in civil engineering.

The same year, she became the first woman to be admitted as a member (with junior status) of the American Society of Civil Engineers (ASCE).



FIRST WOMAN MEMBER.

American Society of Engineers Admits Miss Blatch.

Special to The Pittsburgh Post.

NEW YORK, March 28.—The American Society of Civil Engineers has proved itself liberal-minded and generous, by admitting the first woman who applied for membership. Miss Nora Stanton Blatch, a granddaughter of Elizabeth Cady Stanton, is the first woman member of the society, as she was the first woman to take a degree as civil engineer in Cornell University.

Miss Blatch is not the first woman to become a civil engineer. Western universities and colleges have given the degree to a few women, and few co-educational institutions refuse the course to woman students who might wish to take it. Miss Blatch was offered a position as draughtsman in a large bridge company before she left college. She rested briefly after graduation, and went to work in September.

She worked for the American Bridge Company in 1905–06 and for the New York City Board of

Water Supply. She also took courses in electricity and mathematics at Columbia University so that she could work as a laboratory assistant to Lee De Forest, inventor of the radio vacuum tube, whom she married in 1908. Blatch worked for her husband's company in New Jersey until 1909, when they were separated (they divorced in 1912).

After returning to New York City, Blatch worked as an assistant engineer and chief draftsman at the Radley Steel Construction Company (1909–12) and for several years as an assistant engineer for the New York Public Service Commission (from 1912). She began working part-time in 1914 as an architect and developer on Long Island.

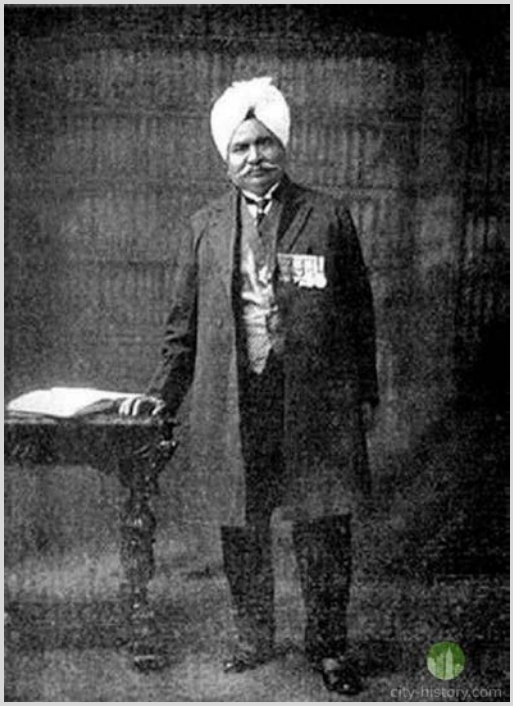
In 1916 she gained notoriety when she filed a lawsuit against the ASCE, which had terminated Blatch's membership when her age passed the limit for junior status; she failed to win reinstatement through the court.

In addition to her work in civil engineering, Blatch devoted her time to the woman suffrage movement. While studying at Cornell she had founded a suffrage club, and from 1909 to 1917 she campaigned heavily for the cause in New York. She became the president of the Women's Political Union in 1915, succeeding her mother, and edited the organization's *Women's Political World*. She subsequently participated in the efforts of the National Woman's Party for a federal Equal Rights Amendment.

In 1919 she married Morgan Barney, a marine architect. They moved to Greenwich, Connecticut, in 1923, and Nora Barney worked as a real estate developer. She remained politically active in her later years, writing such pamphlets as *Women as Human Beings* (1946).

Text Courtesy: Encyclopaedia Britannica, The Editors of Encyclopaedia Britannica

Sir Ganga Ram – a distinguished civil engineer and philanthropist



Born Ganga Ram, Raee Bahadar, Sir Ganga Ram, CIE, MVO, was born in 1851 in Mangtanwala, a town some forty miles from Lahore and fourteen miles from Nankana Sahib. His father, Mr Doulat Ram, who was a junior Sub inspector at a Police Station in Mangtanwala, later moved to Amritsar to become a copyist of the court. Here, Ganga Ram passed his secondary school certificate examination from the Government High School and joined the Government College, Lahore in 1869. Afterwards, he obtained a scholarship to the Thomson Engineering College at Roorki in 1871, where he passed with the gold medal in 1873. He was appointed an assistant engineer and called to Dehli to help in the building of the Imperial Assemblage. Impressed by his work, Lord Ripon sent him to Bradford in the U.K to get further training for two years in Water Works and Drainage. He came back to India and served the Punjab Government in various districts, building courts and government offices in Lahore, Lyallpur and Sheikhupura. He was honoured as Rai bahadur when he came to Lahore in 1885.

Sir Ram as a Civil Engineer

He started service as an assistant engineer, and posted to Lahore, to serve his apprenticeship under the late R. B Kanayyah Lal then executive engineer of Lahore. Ganga Ram had covered a span of twenty-two years, and before him lay the unopened book of his career.

Rai Bbahadur Kanhaya Lal the executive of engineer Lahore, who was considered a very great man those days, gets down the following remarks about him.

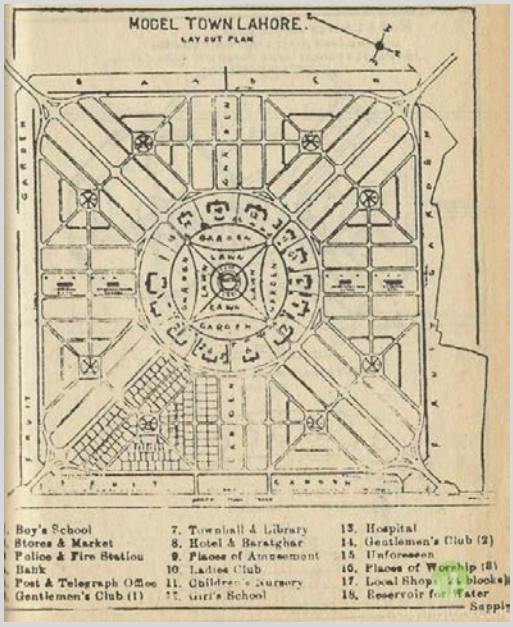
> ***Lala Ganga Ram made a vivid impression on my mind. I still remember his white turban and Kullah, his well-chosen dress posture, his laughing face, and above all the slanting scar on his right eyebrow, which shone like a star and added to his appearance. And he was wearing boots, which were, then, rarely worn by Indians.***

Versatile as he was, Sir Ram tabulated population of India classified according to age, the estimated quantity of food required for each person of the specified age per head, and the total quantity of food required for the whole population.

In 1900, Ganga Ram was selected by Lord Curzon to act as superintendent of works in the imperial durbar to be held in connection with the accession of King Edward the Seventh. He finished the work at the Durbar managing its manifold problems and challenges but his name was not included in the New York Honours list. The bureaucratic jealousy blocked him from being rewarded for his valiant achievements. Consequently, he retired prematurely from service in 1903.

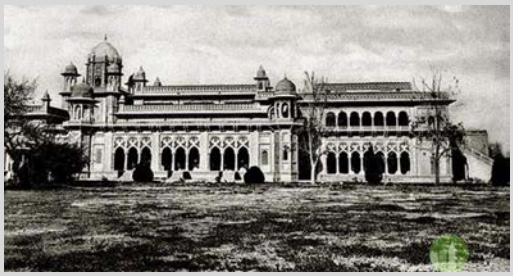
The Contribution of Sir Ganga Ram to Lahore

Sir Ganga Ram dedicated a major part of his life to Lahore as an engineer and a warm-hearted philanthropist, the Ganga Ram Hospital being a stark reminder of the giant that he was.



Map of Model Town Society

He designed and built Lahore Museum, Aitcheson College, Mayo School of Arts (now the NCA), Ganga Ram Hospital, Lady McLagan Girls High School, the chemistry department of the Government College University, the Albert Victor wing of Mayo Hospital, the Hailey College of Commerce, Ravi Road House for the Disabled, the Ganga Ram Trust Building on The Mall and Lady Maynard Industrial School. He also constructed Model Town, once the best locality of Lahore, the powerhouse at Renala Khurd as well as the railway track between Pathankot and Amritsar. He built Sir Ganga Ram Hospital, Lady Mclagan School and Renala Khurd Power House with his own money.



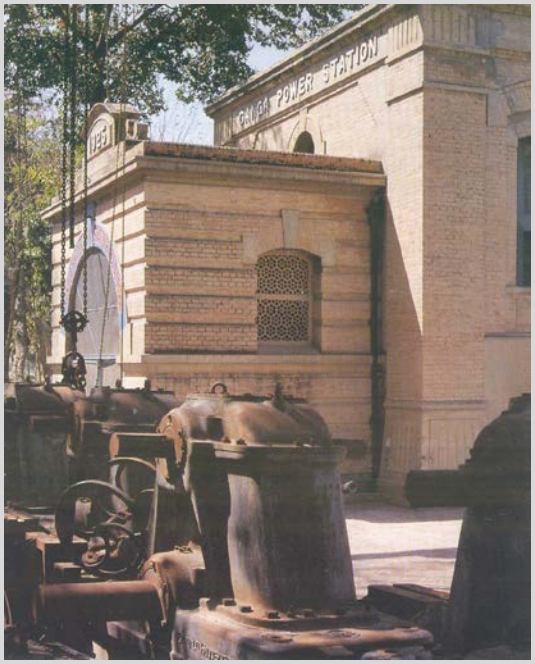
Chief's College, Lahore (1886)

Anglican Cathedral, Lahore (1887)

Prince Albert Victor Memorial Hospital, Lahore (Sketch by Syed Muhammad Latif)

Ganga Pur Agricultural Project

One significant achievement of Sir Ram is Ganga Pur agricultural project writes Sir Edward Mclegan Lieutenant governor of the Punjab who visited the Farm in 1920. A special feature of the whole of the Ganga Pur enterprises was extent to which scientific invention and machinery was used to make the project a gigantic success. Ganga Pur was the first farm to introduce a mechanical reaper, and rigger, and harrows, scythes, sprays and new type of gardening instruments were among the many modern designed and improved tools used. Agricultural experiments the use of modern mechanical devices with steam and electric power, and village planning on a most practical basis are all unique features, of striking or originality and breath of vision and have made the reputation of the estate, but the real triumph of Ganga Purr lies in yet another thing, the trolley which connects the estate with the railway station.



Renal Kurd Power House (Built 1925)

Lahore Museum

At the conclusion of his imperial service, the government allotted him 500-acres of land in the newly settled Chanab colony in Lyallpur. The land was only two miles away from the railway station. With the vision to do better he had done in the Government service, Ganga Ram Became a great agriculturist.

Lahore Museum, Lahore, Commissioned 1894

Generally, people think that the Hailey College Was Founded by Sir Malcolm Hailey. Contrarily to that it was Sir Ganga Ram who conceived this first commerce college of Lahore, with his donation of a few hundred thousand rupees and the support and approval of the Governor. For years the College has served the students of Lahore and even now stands as a prestigious institution of Commerce education. In addition, Ganga Ram also built and endowed the Maynard hall and Hailey hall for the Punjab University. During the period of his posting as an executive engineer of Lahore he has to his credit, design and construction of some of the most magnificent buildings, such as Lahore museum, the Mayo School of Arts, the general post office, the Albert victor wing of the Mayo Hospital, Lahore and the chemistry department of the Government College.

As an ex-officio municipal commissioner he greatly contributed to the development of the city of Lahore. The water works scheme in the city was started as late as in 1875 and, at that time, they were still incomplete and there was on efficient drainage system. Thanks only to Sir Ganga Ram that Lahore first received its asphaltic streets, paved lanes and properly laid drainage system, which mitigated the threat of malaria and raised the standard of health of the citizens. Thus Ganga Ram's influence went much deeper than what the construction of a few buildings might indicate. His new ideas on construction were admired and copied by a good many of the private constructions in Lahore. His also left his signatures on residential architecture of Lahore of his times. In 1925 he was made governor of the Imperial Bank of India, during that time his trust, the Ganga Ram trust building was constructed on the mall.

Post Retirement Period

Soon after his retirement Patialla State acquired his services as superintending engineer for a gigantic project of reconstruction of the city. In the year of his services to the Patialla state he changed its whole face and the Motibagh palace, the Ijlas i-Khas, the secretariat building, the Victoria Girls School, the city high school, the lower courts, the police station and the dispensary, all bearing the stamp of his handwork. During that period, he also got involved in banking through the major bank which he ran was owned by the state. At the end of his services the Patialla state he stated a new life of creative activity at his own farm. A large bungalow was built there in addition to dispensaries, a central square, shops and functional buildings. Today's Faisalabad (Lyallpur) has extended far beyond its limits but Ganga Pur still stands as a model village.

Sir Ganga Ram Hospital

Sir Ganga Ram hospital was constructed in 1921 on the land purchased near Yachhowali. The hospital contained a women's wing, a dispensary and a girls' hostel. A medical college(re-named later as the Fatima Jinnah Medical College) was built near the hospital

The Mall Road

From the leafy end of the Mall that begins with the Aitcheson College to the university and down by the museum it is the spirit and creative vision of Ganga Ram which pervades the air. The arches, the love of traditions mirror themselves in his buildings and they look at home on soil. But in their construction, all the tricks and devices of the scientific west have been employed to improve them, to protect them from the heat and the cold of the Punjab climate, to ensure that sanitation we efficient and unobtrusive, more modern styles have since invaded the mall and the future will show many others with more modern construction and technique but the simple dignity of Ganga ram's building will bear comparison with the best that the future has to offer.

Death

Sir Ganga Ram died in his London home when the dawn was breaking on the 10th of July 1927. His body was cremated and the ashes were brought back to the subcontinent, a portion of them was consigned to Ganga River and the rest buried in Lahore in his Samadhi on the banks of River Ravi.

Honours

He received the title of *Rai Bahadur* in 1903, and was appointed a Companion of the Order of the Indian Empire (CIE) on 26 June 1903 for his services at the Delhi Durbar. On 12th December 1911, in a special honours list after the 1911 Delhi Durbar, he was appointed a Member Fourth Class (present-day Lieutenant) of the Royal Victorian Order (MVO). He was knighted in the 1922 Birthday Honours list, and on 8 July was personally invested with his honour at Buckingham Palace by the King-Emperor George V

The posthumous Samadhi of Sir Ganga Ram (1927)

Professional Practice

Dealing With a Non-standardised Industry of Construction Materials

Practicing in a developing country offers many unique challenges to a civil engineer; dealing with a non-standardised industry of construction materials is only one of them.

Every time one prescribes a rolled steel profile the one actually delivered at site is quite different. With national standards non-existent, very few mills – if at all any – roll profile to any other recognised standard. This leads many structural engineers to adopt used foreign profiles, but again not without the own constraints of even this choice. One has to tailor the design in accordance with what is available in the market.

Not very different is the case of reinforcing steel. Some manufacturers directly roll into reinforcing bars, the material obtained from ship-breaking. Some melt down ferrous and non ferrous materials purchased by way of scrap and produce billets, which are, in turn used for rolling of reinforcing bars. Some use the same process but using spectroscopic investigations attempt to standardise the key ingredient like carbon and manganese. Even some leading manufacturers produce bars with a wide scatter of mechanical properties around

the mean. With a heavy responsibility on his shoulders, the structural engineer is thus continuously subject to a mental agony.

Sheet metal market offers its own challenges. Often produced in SI units, the sheet is commercially sold with thickness specified in so-called gauges. No one understands which particular system of gauge is being referred to. To make things worse still, the vendors stock 20 gauge light, 20 gauge correct and 20 gauge heavy – a completely preposterous system that thrives on deceit and unethical practices.

The dichotomy of units of measurement surfaces in other areas too. Reinforcing bars are purportedly rolled out in ASTM sizes as well in SI sizes. It requires elementary arithmetic to find out that ϕ12 bar provides around 12% less area of steel than #4 bar. Similarly, #6 bar provides around 10% less area than ϕ20 bar. Still, routinely the SI bars are used interchangeably with what are erroneously considered as equivalent sizes.

Voluntary associations in developed countries prepare manufacturing standards and the entire industry complies with them. Even structural lumber is graded and labelled and one needs to do it to pick up a section from the handbook and use it.

With ubiquitous regulatory activity directed at non-standardised and sub-standard materials and services in other areas, the field of engineering remains uneventful in this regard. Perhaps, if the experience elsewhere is any guide, professions best function under self-regulatory regimes.

There is a dire need for work in this direction and PSCE has this issue on its agenda.

Professional Fees

Competing in winning of projects, on the basis of professional fees only, especially in public-sector procurement of services, is a major – but certainly not the only – factor responsible for the lowering of standards of professional engineering services.

The drafting of mandatory procurement rules leave much to be desired. One set of rules, favouring quality over remuneration, is applied to one set of projects while quite another, giving priority to remuneration, is applied to other projects.

Unequal advantage is thus given to poorly managed and inefficient organisations under the garb of quality-first rules thus rewarding mediocrity and inefficiency.

With no national guidelines available over the issue of fair fees and poor to non-existent mechanisms for enforcement of quality of engineering services, the dice is loaded against such organisations which provide ample time to their assignment and provide quality services.

A level-playing field and proper enforcement of clearly defined quality standards for rendering of engineering services and well-enforced code of professional ethics is the only solution if the profession is expected to develop.

It is arguably a very complicated issue and no easy solutions are there for the grabs. But still, one would need to start somewhere and the country is to survive in an increasingly competitive and shrinking world.

Paucity of Continuous Professional Development Opportunities

Opportunities of continuous professional development are alarmingly scarce around us. In a fast developing word and increasing professional challenges, this is an issue that needs to be speedily and efficaciously addressed.

At the moment, practically, each organisation needs to make its own arrangement of the training of its staff – something, even the best-known organisations are reluctant to do. Initiative taken by PEC, while positive in its own right, provides far from an efficacious remedy.

There is a need for easily available, affordable and responsive training. Procrastination on this dire need is certain to cost the profession most dearly.

Contributing to the Pakistan Civil Engineer

The Pakistan Civil Engineers would be happy to receive your contributions. Send a soft copy, whenever possible. You can send:

a) Articles
b) Interesting project pictures (original or free of copyrights)
c) Details of significant civil engineering projects
d) Your professional and reasoned opinion on an important issue.
e) News of professional significance including newspaper clippings, citing source
f) Other important professional information
g) Identification of a topic that merits our attention
h) A letter to the editor

You do not need to be a writer in order to contribute; your professional skill is all we need. Please allow us to make editorial changes before we finally adopt a contribution.