Chapter – III

TECHNOLOGICAL PROJECTS

Colonisation is presumed to improve at least some of existing technologies of the colonized regions. Subjection to the authority of superior power may lead to some innovation through technology transfer. The British attempt to introduce some improved and new technologies in Punjab was, therefore, not unwarranted. Improved technology, in fact, served as the most effective tool for the expansion and consolidation of British Empire in India or elsewhere. There were two paradigms of technological applications under colonial rule. The first was stock of technology which helped the British in their military and commercial ventures. Steam navigation, electric telegraphs, public works and the railways fall in this category. The other set consisted of agricultural and industrial technology which the British introduced, presumably to extract the maximum out of its natural resources.

The history of technology in British India was the story of the introduction and dissemination of western ideas, practices and techniques. The history of science and technology in India was expanded and as the nature of science itself has been subjected to more critical appraisal, the relationship between India and western science has come to be seen as more complex phenomena than previously assumed.

The most influential statement of the diffusions model of western science was made by George Basalla in 1967. He presented a three-phase linear evolutionary framework to explain the ‘spread’ of western science in non-European areas. During phase I, European established contacts with new lands as a part of the process of western renaissance, trade, conquests and colonization. The non-scientific society provides a source for European science;

phase II is termed that of colonial science locally born or resident scientists (whom Basalla assumed to be European scientists) started to participate in scientific activities. Local scientific institutions began to appear while interest in national science continued, but the local scientific community remained dependent upon European expertise and institutions; phase III completes the process of transplantation with a struggle to achieve an 'independent scientific tradition and a national science of their own. A political, educational, and technological infrastructure emerged that allowed modern scientific research thrive, conducted by local scientists operating within national boundaries and in accordance with national needs and priorities².

Basalla typology has continued to be widely cited and discussed. He tried to conceptualise 'colonial science' making it the transitional stage between the first implanting of 'modern science' overseas and eventual maturation into 'national science' and an 'independent scientific tradition'. Basalla tried to compress a complex phenomenon occurring in different culture, areas at different parts of time. He is cavalier with both time and space. In the words of D.W. Chambers, he assumes uniformity and homogeneity where not exists, whether it be western scientific beliefs and institutions, or metropolis colony³. Even as a diffusionist model it tends to be passive. Phase I, for example, is a one-way traffic. Here knowledge flows from the colony to Europe. So how did diffusion take place? In phase II, the colonial scientist is shown as dependent upon an external scientific culture, yet he is not a fully participating member of that culture. In the words of Satpal Sangwan, this is not true. If one looks into the private papers of metropolitan servants one does not find that they ever undervalued the scientific potential of their peripheral colleagues⁴. Inkster shows how Australian secured a place within the invisible college. And in phase III,

². ibid.
Many conditions mostly structural, have to be fulfilled before the embryo conceived in phase II is granted an independent existence. The umbilical chord never gets snapped in a Eurocentric model. This may be true for Australia and Canada but what about India or Egypt? Basalla largely ignores the facts that the countries like India had a long scientific and technological tradition of their own. Indigenous tradition did not simply evaporate with the first warming rays of Occidental sun; they were initially the subject of close. Often appreciative, European scrutiny, and though in India they were marginalised during the course of nineteenth century; they continued to play a vital practical or ideological role. In Basalla’s Eurocentric model dynamism belongs to an (improbably) homogenous west, leaving the rest of the world to participate only passively in the process of diffusion, unable to make any contribution of its own men or even to negotiate with an ascendant western science. Scientific knowledge and ideology of science, it has been argued by Dhruv Raina and Irfan Habib, Contra Basalla, can be actively redefined as the milieu of a recipient culture. The receiving society, from being supine, subverts, contaminates, and reorganises the ideology of science as introduced by Europe5, though one might add the caveat that the extent to which ‘ideological subversion’ could actually succeed in India before 1947 was constrained both by the political and financial control exercised by the colonial regime and by the influence and authority of the international scientific community.

From the coloniser’s point of view, the late 18th century was an exciting time; several tracts and travelogues on India appeared. Among them, the important ones are by W. Robertson, Hugh Murray, G.R. Wallace, J.M. Honigberger, F. Buchanan, M. Martin, R.Heber and M.Jacqument6. The information was often jumbled but writers seldom lost sight of what they considered ‘useful’. They faithfully reported what was best in India’s natural

resources and technological traditions and what could be most advantageous to their employers. It is well known that India had a wide range of existing technologies but British rejected them as stagnant, clumsy, old, outdated, and crude. So they started the process of technology transfer. This process of transfer of technology and augmentation duly highlights the importance of exogenous innovations and the role of technology as a ‘tool of Empire’\(^7\). It became one-dimensional idea stressing the dynamism of the British and ignoring the Indian content in which new technology is employed.

Knowledge of the local terrain, local resources, customs and traditions was vital for the founding of colonial state. The British realised that they had to tread cautiously. And in order to legitimise their own rule, they de-legitimised several pre-colonial technological structures and texts. Indians were declared unscientific, superstitious and resistant to change. India was identified with dirt and diseases. They considered their knowledge a superior one and denounced whatever scientific knowledge (e.g. in astronomy and medicine) the Indians could boast of. Indians were described as ‘half devil and half child’. William Jones, the foremost Orientlist declared that in scientific accomplishments, the Asiatics were ‘mere children’ as compared with Europeans\(^8\). Yet a few Colonial Scholars showed respect for certain indigenous scientific techniques. They wanted western knowledge to permeate slowly and cause gradual displacement\(^9\). Indians too on their part became inclined towards new science and technology. The appearance of the surveyor, the plant collector, mineralogist and the introduction of steam vessel, steam railway, electric telegraph, printing press, telescope and a host of other inventions began to attract the attention of local populace. Besides, with the reduction in the time of travel between England and India from almost more than a year to few days\(^10\), the flow of scientific

\(^8\) Ibid., p.229.
\(^9\) Ibid.
\(^10\) By the mid of nineteenth century , however the employment of steamships had reduced it to only thirty days. *The Lahore Chronicle*, 17 May, 1854.
information from the western world became more rapid. It was followed by an unprecedented increase in scientific activities. The technological projects like steamer, quinine, and quick firing-gun made European expansion swift.\(^{11}\)

The desire for material gains and the imperial ambitions might have led to the introduction of new technology but there is no doubt that the commercial interests were the main factors behind the introduction of new technology. The British also had imperial intentions in mind, which were made clear by them through various pronouncements and observations at the onset of their rule in India.\(^{12}\) Like building of political unity, for creating economic prosperity, for establishing peace and order and last but not least to meet the demands of the manufacturers in England to open vast markets in the interior of the colonies, to sell the products of British industry and to facilitate the export of raw materials and foodstuffs to the hungry machines in Britain. An outlet was required for this capital, and, if the Indian Government was to adopt a programme of railway, road constructions, telegraph, modern agriculture and irrigation, then this surplus capital could be loaned to them and thus, an outlet would be found by itself. Thus, the development of the technological projects was required for the benefit of English merchants who were powerful in England and had control over the parliament where all those policies were regarded as the best which pleased them. Moreover, laying of new projects provided employment to Englishmen.\(^{13}\) So, the interest of the British industrialists, manufacturers, and capitalists urged the government to start technological projects in India and establish a good transport system here.\(^{14}\)

In 1857, there occurred a revolt against western influence. According to V.A. Smith, it was the revolt of old against new of Indian conservatism against

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aggressive European innovation\textsuperscript{15}. The object was to restore the old order and to make India what it had been before the obnoxious British rule. There was a genuine fear that Government intended to Christianise Hindus and Muslims\textsuperscript{16}. The changes, social, political and economic changes which took place in the second half of the 19\textsuperscript{th} century were so revolutionary that those which took place in the first half are scarcely comparable with them. Modern India may indeed be said to be practically a post-mutiny creation owing to the alterations in the condition of life which have followed an immense increase of population\textsuperscript{17}, development of industry, introduction of modern western civilisation particularly what Governor-General Lord Dalhousie called the 'three great engines of social improvement', which science had already given to the west, the railways, the postal system and the telegraph. These effected a revolution in inter-communication, breaking down geographical barriers and bringing widely separated tracts and communities into contact.

The British while annexing the Punjab had almost the same aims, in 1849, A.D. Hence, the British were all set to introduce new technology here. Transport was a contributory factor, which by increasing the place-value of the produce gave an impetus to the increase of production, both quantitatively and qualitatively. Thus, modern technological projects were started primarily to serve the economic, political and military interests of the British in the Punjab\textsuperscript{18}. The main aim of British was to develop the resources of Punjab, foster trade, agriculture and commerce, explore mineral resources of the Alpine regions bordering the Himalayas, which was possible only if they possessed a good transport system\textsuperscript{19}. Lord Dalhousie's famous minute of 1853, explains the intentions behind the development of the means of transportation. He said that the Punjab could be used as a market for British manufacturers and a supplier of

\textsuperscript{17} Ibid.,79.
\textsuperscript{18} A.R. Desai, Social Background of Indian Nationalism, pp. 129-130.
\textsuperscript{19} Punjab Administration Report 1849-50 and 1850-1852.
agricultural raw material and once its means of communications were scientifically developed to the potentialities of the Punjab, it would act as a field of investment for the British capital. Moreover, the British wanted to transform Punjab into an agricultural colony of Britain. These facts strengthen the notion that the technology was developed basically to meet the imperial requirements in Punjab.

Here were various facets of technological development in Punjab during the British rule. The first was advanced technology like railways, electric telegraph, and civil engineering. The second was improved model of agricultural technology, industrial technology and medical technology which the British introduced, presumably to extract the maximum out of Punjab’s natural resources.

Railways

The most important technological project undertaken by the British was the railways, which were by far the most important part of the system of communication in India. They made their appearance in this country in the time of Lord Dalhousie. In his famous Minute of 1853, Dalhousie advocated the construction of railways in India on an ambitious scale, a series of trunk lines uniting the various provinces and connecting the trade-centres inland with the principal ports. But the primary motive of the British in constructing railway lines was commercial. They looked upon India as a source of raw material and cheap food and as a market for their finished goods. Another important object that the British had in view was military. Railways, it was thought, would enormously add to the military strength of the country by providing increased facilities for the movement of troops and material to the frontier or to any scene of disturbance, at

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a greater speed and less cost. It was also realised that without the material appliances, which facilitate and cheapen the means of communication and production, there could be no substantial progress in the country either morally or materially, or in the efficiency of the administration.

The progress of railway was much slower. Proposals for the construction had been made to East India Company in 1844, but the Directors thought them doubtful on account of climatic difficulties. The want of qualified engineers, and doubts as to financial success. One objection, which was raised that railways would not pay, as Hindus would be debared by caste scruples from making use of them. Even such an authority as Hoarse, Hyman Wilson thought that this was a serious hindrance to their popularity, but John Clark Marshman (a British official) obtained a ruling from the body of orthodox opinion by the Dharma Sabha of Calcutta to the effect that a pilgrim could travel by railway without losing the merit of pilgrimage. There were few scruples about railway despite the risk of contamination from contact with fellow passengers of low or untouchable caste.

The first railway line in India was started from Bombay to Thane. The development of railways in Punjab was more or less exercise of technology transfer. But in maneuvering the whole operation, the British had to face great physical and technical challenges. Introduction of railway in such a vast territory covered with numerous rivers and mountainous ranges involved high engineering proficiency and courage. It required scientific assessment of the local material to be used in railway construction and a well-trained class of local mechanics and artisans to build and operate railways.

For meeting these requirements a Railway Technical School was opened in Punjab. Railway development in the Punjab passed through three distinct phases of policy. Up to 1869, the construction and working of railways in the

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Province was left entirely to companies with some form of guarantee. There were four separate undertakings of the Sind Railway Company, namely, the Sind Railway, the Indus Stream Flotilla, the Punjab Railway and the Delhi Railway. They had a common management but separate shares and accounts. These undertakings constructed a few railway lines in Punjab during this period. On 1 July 1870, the government amalgamated the above-mentioned four separate undertakings of the Sind Railway Company into one company called ‘Sind, Punjab and Delhi Railway Company’. This was done for administrative convenience and the Government took over the construction of railways.

Extensive countrywide railway projects however could not be successfully carried out without the ‘subordinate cooperation’ of the Native States. So the British not only encouraged the Native Chiefs to construct railways in their territories, but also rendered them all possible aid and assistance in carrying out such projects.

A laconic account of the important railway lines comprised in the North-Western railway system may be given here. The Amritsar-Pathankot Railway was the first line which the Punjab Government has taken in hand. The people of Punjab enthusiastically responded to the construction of railway line in Punjab. This railway line was planned and completed by Sir Ganga Ram who was an engineer under British government service. The entire contract of Amritsar – Pathankot Railway line was taken by Lala Mela Ram including ironwork, sleepers, and masonry, which he finished with his energy well within contracted time. The government was much pleased at his resourcefulness and granted him a special award of Rs. 50, 000/- for his performance. The other lines are Kalka–Simla Railways, Ludhiana -Dhuri- Jakhal Railways, Rajpura - Bathinda

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30. Ibid., pp.251-252.
31. PWD (Railway), A, Railway Construction Proceedings, June 1884, Nos, 80-103.
Railways, Jind-Panipat Railway, Amritsar-Patti-Kasur Railway, Sirhind-Ropar Railway, and Delhi-Ambala -Kalka Railway etc. constructed by British with the help of people of Punjab and Native rulers.

The progress regarding railways in the Punjab was slow. Though a network of railways served the Province after the Second World War but that was very late. Still there were some portions where the railway service was inadequate, e.g. the Himalayan tracts in the north and the east in which the only lines were the Kalka-Simla and Pathankot-Joginder Nagar, Dera Ghazi Khan district and the eastern part of Bahawalpur State.

The extension of railways in the Punjab was deeply influenced by the presence of rivers. Their bridging required money and labour. So, the difficulties and expenditure to be incurred upon their bridging prevented the British from the construction of lines running from northwest to southeast. In spite of the fact that many economic, military, political and social advantages accrued from railways, railways could not receive the proper attention of the British in this Province. The total railway mileage in the Punjab was only 23 in 1863. It increased to 1056 miles in 1881 and to 3117 miles in 1901. Further, it increased from 3725 miles in 1910 to only 4281 miles in 1921. It rose to 6160 miles in 1931 and to 6192 miles in 1939. The almost negligible increase between 1931 and 1939 was due to the presence of rivers and the difficulties in their bridging.

36. *History of Indian Railways Constructed and in Progress Corrected up to 31st March 1929*, Delhi, 1940.
39. *Punjab Legislative Council Debates*, 7 March 1927, Vol. X, No. 4, (Lahore, 1927) p. 117. The District of Dera Ghazi Khan was nearly 300 miles long and 30 to 40 miles wide but in the whole of that district there was not an inch of railway line.
42. *Ibid*.
43. *History of Indian Railway Constructed and in Progress*, p. 158; also see *Imperial Legislative Assembly Debates*, 23 February 1925, Vol. V, No. 21, (Delhi, 1925), p. 1354.
to the economic depression, which ushered in an era of railway deficits and retrenchment in expenditure on fresh extensions.

Much waste of time and money was caused by the frequent change of gauge of railway lines in the Province because no proper attention was given to the gradual establishment of a one gauge system and unitary system for the new construction. The break of gauge and the diversity of agency employed in the construction of the different lines, both were the plain indications of the vacillation and want of definite principles of action which had marked the railway policy of the Indian government. To sell a railway one day, buy another the next, to build a railway and then gave it to a company on lease, and at the same time to take over another line on lease. These inconsequential proceedings were sufficient indication of the want of systematic policy and good judgment which had characterised the railway administration of the Indian Government.

Further, to provide increased facilities in the administration of the country and in view of the greater mobility which railways gave to military forces, a large mileage of unproductive lines was constructed e.g. up to the year 1900 about 590 miles of such railways had been constructed. But the government of India did not place the burden of the strategic lines of the military department. Although the strategic lines did no good for the province of Punjab, yet it was made to bear a part of the burden of their maintenance and up-keep. The commercial railways in the Punjab especially the north-western railway were a profitable enterprise, perhaps north-western railway was the biggest profit-earner railway system in the country (about 6 to 7 per cent). But the strategic railways and Kalka-Simla railway which was not paying even 1/8%, proved a big drain on the financial resources of commercial railways in Punjab which was unfair to Punjab. Besides, attention was not directed to connecting contiguous trade

45. History of Indian Railways Constructed and in Progress, p. 155.
47. Ibid., 3 March 1936, Vol XXVIII, No. 6, (Lahore, 1936), p 243.
48. Shaikh Muhammad Sadiq (Amritsar city, Muhammadan, urban) called the Kalka-Simla Railway, the white elephant. Ibid., 28 July 1933, Vol. XXIII- No. 25, (Lahore, 1933) , p. 1170.
points of Punjab and to exploring thoroughly the trade of each district of this Province through which the railway passed by a systematic control of feeder lines.

Punjab was mainly an agricultural province, 95% of its population having been engaged in agricultural sector. The crops did not find good markets for want of railway facilities from the village at a moderate rate. Ujjal Singh, a member of the Punjab Legislative Council, strongly criticised the running of railways in Punjab. He said 'railways are being worked and run without any regard to the interests of the agriculturist. As a matter of fact, we feel that they are not being run even on commercial lines and as a public utility concern, they are not being run in the interests of the Public'.

The wealth of Punjab consisted in the produce of agriculture, which was exported to foreign countries through the Calcutta and Karachi ports. The increase of railway rates since 1917 had been almost doubled in many cases. On the one hand, the rates of produce of zamindars had fallen very low, and on the other hand, the railway freight had increased. In the course of discussion on railway freight in the Legislative Council on 27 July 1933. Ch. Allah Dad Khan representing Ambala Division (Rural) remarked: 'It is very strange that while zamindars are dying, here is the Government of India congratulating themselves on the greatest exploitation that they have made of the zamindars, not of all the provinces but mostly of the Punjab'.

Ujjal Singh strongly denounced the increased railway freight and vigorously pleaded for their reduction which would have the effect of stimulating movement of commodities. Admitting that the Punjab Legislative Council had

52. Ibid., p.1098.
no jurisdiction to criticise the railway policy in general or the heavy expenditure involved on the staff or the money lavishly spent on building new palatial railway stations, he remarked that as tax-payers they certainly had a right to ask as to why the Government should spend money so extravagantly instead of coming to the help of the poor agriculturists.

Sayad Mubarak Ali Shah, another member of the Punjab Legislative Council expressed similar views while moving his resolution regarding excessive railway freights that were detrimental to the interests of the public in general and the agriculturists in particulars. Citing the example of Australia he held that the attitude of the Indian Government towards providing facilities to the general public as compared to that of Australian Government was depreciable. Mukand Lal Puri representing the interest of the Punjab Industries considered the resolution of Mubarak Ali Shah as the most important one placed before the House. He emphasized that the resolution should not only be considered from the point of view of competition with the foreigners, but also form the point of view of the position of this province as compared with other provinces of India. Some of the members asserted that railways were spending lavishly on unproductive items like providing more amenities and facilities to their own employees, rather than the general public. These remarks show very clearly the callous attitude of the British government towards the welfare of the Indian public. The British did spend wastefully for the expansion of railways. They gave priority to railways over canals and roads. Again during 1890-91, the total amount expended on railways from both imperial and provincial revenues was rupees 1,98,615, while on canals it was only rupees 54,977.

54. Ibid., p. 1095, Sayad Mubarak Ali Shah said, ‘In order to effect this reduction in railway freights the Australian Government effected 25 or 30 per cent cuts in the salaries of railways employees which still continue whereas the Government of India has this year, restored 1/2 of the 10 per cent cut which was effected a couple of year back’.
56. Ibid., 28 July 1933 Vol. XXIII No 25 (Lahore, 1933), p.1175.
57. Punjab Administration Report 1890-91, Appendix No. 51, p. CXXI.
On the other hand, the railways were so constructed as to connect powerful ports with the big cotton producing centres and later with sources of oils seeds and wheat. The consideration for constructing railway lines in the Punjab was also more of a political and strategic nature rather than commercial because the British Government had to set up many big cantonments like Peshawar, Bannu, Kohat and Quetta etc. in order to defend their North-West Frontier from the unruly and marauding Pathan tribes and adventures of the ruler of Kabul. It is evident that the British were interested in serving their own ends, rather than those of the people of the Punjab.

Later, railways became a major focus of nationalist criticism of the colonial state’s policies and practices in the earlier decade of twentieth century as the national struggle intensified, nationalist writers provided critical commentary. Dada Bhai Naroaji made the expenditure on railways an important component in his analysis of how Britain was draining the wealth of India58. B.G. Gokhale in the Governor General’s Legislative Council criticised railway policies and practices in 190959. Mahatama Gandhi observed the railways tightened the British grip on India. It was beyond dispute; he said that railway propagates evil. Nonetheless, Gandhi assigned to the railways a significant albeit negative role in the transformation of South Asia60. Lala Lajpat Rai called the railways in this country one of the two white elephants on which the great bulk of Indian revenues had been spent under the British rule, the other was the army61. There is a reasonable ground of complaint against the extravagant62 and wasteful policy 63

58 Dada Bhai Naroaji, Poverty and UnBritish Rule in India .
62. Before the First World War there was no dearth of funds. Railways were getting as much as they wanted under the recommendations of the Mackay Committee of 1908. While the capital cost of the State Railways had gone upto an unprofitable extent the railway administration were piling up the capital expenditure on the same lines under the convenient name of rehabilitation.
of the colonial government. In a poor country like India, it was hoped that a cheap transport agency would be developed. Canals could serve the dual purpose of irrigation and cheap transport and it would have been infinitely more profitable to invest capital on the extension of irrigation than on railways. As R.C. Dutt, the great Indian economist wrote, ‘Englishmen in their own country were more familiar with railroads than with canals, and they made the mistake of judging the needs of Indians accordingly.’ In the Punjab, where magnificent canals had been constructed for irrigation purpose, they could be used for transport purpose also with slight alterations, and certain kinds of goods could be carried at a very cheap rate over canals. Of course this programme could not be so helpful to British manufactures, but the interest of the people of the Punjab should have been the major determining factor in this matter.

Nonetheless Gandhi rode the rail despite its ‘evil’ contribution to the maintenance of British rule. He and other nationalists used the Railways to advance the nationalist cause. Others took a different approach and sought to confront physically the advantages the railway lines provided to the colonial authorities. Some tried to destroy Railway lines in an effort to cripple those corridors of power along which the security forces moved from place to place within India. Michael O’Dwyer understood that Railways were interstitial corridors of power that facilitated the control of places. Spaces between places were as important as the places themselves. Yet others, such as the viscerally aggrieved among whom one sometimes found Railways workers, who had been disciplined or fired, wished to destroy Railways because they were visible and accessible upon which they could vent their anger and frustration. There is no doubt that Dalhousie realized that railways were works of public utility and as such it was the duty of the government to regulate them in public interest. But

and improvement of open lines. Imperial Legislative Assembly Debates, 23 February 1925, Vol. V, NO. 21, (Delhi, 1925), p. 1395.
63. In 1920-21, the working expenses on railways was rupees 54.5 crores; in 1921-22, it rose to rupees 66 crores while on posts and telegraphs the working expenses in 1920-1921 was rupees 8 crores and in 1921-1922 it rose to only 9 crores. Imperial Legislative Assembly Debates, 7 March 19-22, Vol. II, No. 41, p. 2828.
64. The Tribune, 2 July, 1922, p. 2.
this regard for the public interest was subject to the limitations imposed by British capital managements and by British commercial and economic interests. It is a matter of common knowledge that railways were indispensable to the welfare of the whole community, not simply of a part. But as a rule, the interests of the foreign capitalists were given precedence over the interests of the native public and wherever a conflict arose the latter were sacrificed for the sake of the former. It is interesting to note that on one hand the British Government in India encouraged the Native States, especially in the Punjab, to construct railways in their territories and render all possible aid and assistance in carrying out such projects, while on the other, they virtually laid down and controlled the policy regarding the alignment, construction standards and maintenance of railways in the Native States. Although this was done under the garb of the general interest of the country as a whole and in the interest of the Native States themselves, yet the real purpose of this arrangement was effective subjection and control of the Native States in all eventualities. This was all the more necessary because of the geographical location and proximity of Native States with the British occupied territories. In short, all the incentives for development of railways in the Native States of the Punjab were in a way oriented to the needs of the Government of India rather than a sense of well being of the States or their subjects.

This latent object of the British government is further corroborated by the 'Sanads' (contracts of agreements) of 1860 and 1863 by which the Chiefs of Patiala, Nabha and Jind States were bound to give land free of charge for construction of railways and codify sovereignty thereof to the Government of India as they were more amenable to British government's wishes. But this policy

65. The general policy of the British Government towards the Native States regarding railway construction was that a State could not build railway lines unless they were absolutely unconnected with other lines and were purely for internal purposes. Harcharan Singh, British Policy towards the Cis-Sutlej States 1905-1947, unpublished Ph.D. thesis, Punjabi University, Patiala, 1990, pp. 28, 182-212.
was carried out in Bahawalpur and other States also although no such mention occurred in the sanads issued or treaties concluded with such states. It was a blatant effort of the government of India to erode the sovereignty of the Native States and to ensure their speedy and effective subjection through well controlled networks of railways in these states. On the other hand, the acquisition of land from the Native States free of cost for the construction of railways can be justified by the fact that the native states were also the beneficiaries of this facility. At the same time, not compensating the private landowners whose lands were acquired for this purpose cannot be justified in any way, as they were not necessarily exclusive or even collective beneficiaries of this facility. All high sounding claims of uplift of State subjects were in reality only a smoke screen.

As far as the police, criminal and civil jurisdiction of these lines is concerned; the British government in India considered itself justified in taking over all powers thus eroding the sovereignty of the rulers of the Native States. Otherwise it would have made it virtually impossible for the government to run railways on these lines according to the laws and judicial systems of each and every Native State through whose territory the lines passed. Whatever be the ulterior motives or vested interests of the British government in assuming full and exclusive jurisdiction on these lines, the fact remains that these lines would not have been worked efficiently and smoothly, had this measure not been taken by the British government in India.

It may also be pointed out that although the government derived bulk of its income from the Native passengers in railways, it did not sufficiently bother about their care and comfort. They were exposed to great inconvenience. The editor of Victoria Paper remarked: If the present head of the Indian Administration were to travel in a third class carriage only once, he would feel convinced that the lot of

68. Qaiser-ul-Akhbar (Allahabad), 7 November, 1880.
69. See, Punjab Organ (Wazirabad), 12 January 1900.; Paisa-Akhbar (Lahore), 17 March 1900; Koh-i-nur (Lahore), 3 April, 1900; Akhbar-i-Am (Lahore), 15 October, 1900; Sialkot Paper (Sialkot), 5 January, 1904.
the third class railway passengers was really pitiable in the extreme. Though these passengers were the contributors of the major part of railway revenues, the government did not pay any regard to their comfort. Mr. Wilson one of the members of Legislative Assembly frankly admitted, 'We are here not for granting relief, but for making profits.' The Wafadar (Lahore) of 22 July 1892 published a communication from a traveler complaining:

1. That the trains stopped for only a very short time at the various stations, with the result that ignorant people and especially female passengers were put to great inconvenience;

2. That water was not available at railway stations;

3. That the trains drew up at a considerable distance from the station platform, thereby causing great inconvenience to passengers.

The first class passengers formed 19% of the total number of passengers travelling in trains. Second class formed 1.69%, intermediate class formed 2.12% and the third class formed 96%. But first class seats available on Indian Railways were 3.02% about 15 times more than the percentage of the number of passengers. The percentage of second class seats provided was 5.05 i.e. about 4 times larger and for the intermediate class the percentage of seats provided was 5.63 i.e. about twice the number of the percentage of the total number of passengers. As regards the third class, the total number of seats provided was 86.3%. This tends to suggest that greater consideration was shown by the railway authorities generally to the privileged class passengers. The treatment

70 Victoria Paper (Sialkot) 22 July, 1900; see also Imperial Legislative Assembly Debates, 7 September 1922, Vol.III, No. 3, (Delhi, 1922), p.229.
73 Wafadar (Lahore), 22 July, 1892; Report of Native News Paper Punjab, 1892, p.256.
74 See also Gulzar-i-Hind (Lahore), 14 April, 1904, Report of Native News Paper Punjab, 1904, p.126.
of third class passengers was simply deplorable. On the occasion of fairs and festivals, they were carried like cattle in wagons.

Moreover, during the First World War many trains were cancelled for civilian population, because it was thought necessary first to meet the necessities of the movements of troops. Goods wagons were used to carry passengers on lines. The goods lay in the godowns for weeks before they could be loaded. In 1922, the government issued instructions to the railway administration to put a stop to the practice of conveying passengers in goods vehicles. But even then this evil was not remedied. Furthermore, railway accidents had become very frequent. Aftab-i-Hind remarks that 'not a day passes without hearing of a collision'. This shows the negligence on the part of railway employees and at the same time it speaks of callous indifference of the government towards it.

Despite the aforesaid shortcomings, the fact remains that railways are undoubtedly an important legacy of the British to the people of this country. It may be said that the introduction of this great invention imparted a stimulus and a vital energy into all the affairs of man. Railways had been a very important contributory factor in accelerating the pace of national advance, in enlarging the opportunities for political and social changes, and in building up the economic fabric of the country. Besides, vastly increasing the volume of trade and manufactures in the country, railways also banished the dreaded specter of uncontrollable famines in the Province. Railways also provided India with the most dispersed form of Industrial employment in colonial India, the Railway Workshop. These workshops were located throughout the continent for example, Lahore shops of North-Western Railway. The Jamalpur shops of East Indian

77. Imperial Legislative Assembly Debates, 22, February 1936, Vol.VII,No.20, Delhi.
79. Aftab-i-Hind (Jalandhar), 5 March ,1892 ; Report of Native News Paper, 1892, p. 81.
Railway, the Kanchrapara shops of Eastern Bengal State Railway etc. The Lahore shops had over 2000 employees in 1880 and 4500 in 190680.

But whatever benefits were conferred by railways on agriculture and industries were rather indirect and incidental. It is not difficult to understand the real motive of the foreign rulers behind the introduction of railways in the Punjab. In the beginning, it was a commercial enterprise but after the Revolt of 1857 railways became a part of the military might of the British rule, so that the troop trains could move easily to the frontier or to any scene of disturbance and could supplant the long march and the relief column. Therefore, the development of railways in India in general and in Punjab in particular, was motivated more by political considerations rather than the welfare of the public.

**Telegraph**

Another important innovation introduced by British is an Electric Telegraph. The word 'telegraph' is derived from the Greek words: 'tele' meaning 'a far off' and 'graph' to write.' In its broad sense it had been used to designate any means by which messages were transmitted to a distance by signs or sounds. But in modern times, it has been used to describe the electrical transmission of written or printed communications81.

Telegraph was brought to India as soon as its value had been demonstrated in England. Railway was largely initiated by and financed by private merchants for the expansion of the trade while the electric telegraph was financed and managed by the government. In England, telegraph grew as a commercial adjunct to Railways but in India it came ahead of railways. The

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reasons were basically political\textsuperscript{82}. Externally, overland and sea routes had to be made invulnerable to any hostile, putative Russian advance\textsuperscript{83}. Internally, the successive annexation of local states had considerably expanded the range of imperial activities. No wonder, the authorities felt the pressing need for an electric telegraph system in India. Various proposals were made earlier for plantation of electric telegraph in India. It was only in 1849, when Lord Dalhousie (1848-1856) was engaged in continuous conflict with the Indian States that the electric telegraph was officially proposed\textsuperscript{84}. The railway contracts were signed on 17 August 1849 but the need for telegraph system was so urgent that the Court decided not to wait for the construction of telegraph lines along with the railways\textsuperscript{85}. Dalhousie is actually regarded as the father of the electric telegraph in India who gave every possible help and encouragement to Dr. Shaughnessy for laying telegraphic wires in India. It was necessary for the different parts of this wide territory to be more closely united. He roused the East India Company’s sleepy style of civil administration into one of up-to-date English efficiency\textsuperscript{86}. ‘Everything, wrote Dalhousie moves faster now-a-days all the world over, except the transaction of Indian business’\textsuperscript{87}. On his return with the requisite sanction, Dr. Shaughnessy became the Superintendent of Electric Telegraphs in India\textsuperscript{88}. The construction began in November 1853 and within three years. Dr. Shaughnessy was able to connect Calcutta with Benaras Allahabad Ambala Lahore and Peshawar\textsuperscript{89}. In 1852, Dr O’Shaughnessy (1809-1889) (afterwards known as Sir


\textsuperscript{83} Russophobia had been an important feature of the Post-Waterloo British foreign policy.

\textsuperscript{84} S.K. Ghose, The Introduction and Development of Electric Telegraph in India, p. 88, note 81.

\textsuperscript{85} Court to Governor- General, 26 September 1849, Dispatches to India, IOR, E/R/801, pp. 1081-1085.

\textsuperscript{86} S.S. Thornburn, Punjab in Peace and War, (Patiala: Languages Department, Punjab 1970), pp. 32187, 32190.

\textsuperscript{87} John Clark Marshman, Abridgment of the History of India, from the Earliest period to the Present Times, (Edinburgh: Blackwood, 1873), p. 486.


\textsuperscript{89} D.R. Headrick, The Tools of Empire, p. 158.
William Brooke was deputed to London to lay before the court of Directors his scheme for erecting electric wires over the length and breadth of India\textsuperscript{90}.

Many difficulties had to be encountered in creating a telegraph system, which were overcome successfully\textsuperscript{91}. Jungles had to be traversed. It was feared that the wild beasts and storms, would spoil the work, and there were no skilled engineers\textsuperscript{92}. Moreover, the telegraph lines were bound to traverse the territories of the Native States; this difficulty was, however, overcome by the British authorities by concluding agreements with the Native Princes which provided for the free grant of all land needed by the government of India for the purpose of telegraph\textsuperscript{93}.

The construction work of the first telegraph lines in the Punjab was commenced in the latter half of 1853 and prosecuted vigorously. By October 1854 the line was in working order as far as Lahore, and as far as Peshawar by January 1855\textsuperscript{94}. The telegraph extended East and West along the grand trunk road from Karnal to Peshawar, which provided instantaneous communication between all the large northern stations. It covered a distance of about 520 miles. From civil, military, and political point of view, the telegraph offices were opened in the same year at the most important places namely, Ambala, Jalandhar, Lahore, Rawalpindi, and Peshawar. At each office there was one head assistant and two or three signalers, in all about 25 men, all Europeans. This establishment proved to be efficient and well organized and gave satisfaction to the government and public\textsuperscript{95}.

\textsuperscript{90} H.G. Keene, \textit{History of India}, p. 213
\textsuperscript{95} \textit{Punjab Administration Report 1854-56}. (Calcutta,1866), paras 115-17.
Telegraph was exclusively an imperial innovation designed to serve the military purposes. The selection of telegraphic lines was made entirely under strategic guidelines. Some officials had even predicted that Indians wouldn't use the new means for social intercourse. In the beginning Indians and Punjabis believed, the sending of message by wire to be devilish witchcraft and preferred runners to telegraph. But with the passage of time people began to appreciate the benefits of telegraph service and willingly started availing of this amenity. But when it was finally opened in 1855 for private use, people in large numbers showed their interest to take connection for all family affairs, such as marriage betrothals and other domestic affairs. In the first year of operation, Indians accounted for one-third of the messages sent. Two newspapers, The Delhi Gazette and the Lahore Chronicle, were the first users of the telegraph in India for journalistic purposes. The public use of telegraph was allowed in practice, however, as the London Times correspondent W.H. Russell remarked, 'The electric – telegraph is conducted with such utter indifference to good faith, that it is practically a swindle, and nothing else or less'. When local merchants approached the Company for the telegraphic facilities at some places, the latter would not agree to it.

The telegraphic communication proved of great advantage to the Punjab administration during the crisis of 1857 because for months this was the only means of communication open to the government. 'The telegraph was worth thousands of men to us in the mutiny of 1857', wrote W.W. Hunter and 'it was by

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96. The British government claimed its monopoly by the first telegraph Act of 1854 that no one could make a telegraph without a license and a license might even be suspended at any time. For detail see The Bombay Times and Journal of Commerce, January, 17, 1855.
100. The merchant community of Malwa, chiefly engaged in Opium trade, for instance, had solicited the extension of electric-telegraph communication between Indore and Allahabad. But their request was turned down ruthlessly. Home Electric Telegraph Proceedings, January 9, 1857, No.1.
the railway and telegraph that India was then strategically held. In a campaign lasting over a year, thousands of telegrams were transmitted; giving credibility to the views of many British who believed that ‘the electric telegraph saved us’. A sepoy on his way to execution pointing to a telegraph line exclaimed that it was the accursed string that strangles us. The telegraph increased the security of the Empire, and augmented the facilities for government manifold. The telegraph carried the news from one place to the other while still fresh and warm; and the same instrument carried back within effective time orders or messages based on the last development of circumstances. Hundreds of messages were received and sent in a single day. Through the agency of telegraph the British authorities at Lahore were forewarned of the seizure of Delhi by the Meerut mutineers almost immediately because of a timely telegraphic message sent by an enterprising telegraphist. It enabled the authorities to take timely measures to disarm Hindustani Sepoy regiments before their plans were ripe for execution. Punjab was thus saved from much bloodshed and confusion, perhaps even the British dominion in Bengal from temporary extinction.

Delhi and Lahore were already in telegraphic communication before May 1857 but at other places also electric wires were rapidly set up because ‘the mutiny’ had increased its urgency. Between 1870-1875, telegraph lines connecting Ludhiana and Ferozepur, Rawalpindi and Kohat and Simla, Lahore and Mian Mir were opened. A line between Lahore and Wazirabad was

108. Ibid.
111.Ibid.,1873-1874, para 246.
constructed in 1877\textsuperscript{112} and in September 1878 between Amritsar and Dalhousie \textsuperscript{113} and in 1883 between Amritsar and Pathankot\textsuperscript{114}. The telegraph system of the Punjab was (or may be claimed to be) fairly complete in the eighties of the nineteenth century, since new towns and more than 8,000 inhabitants remained to be connected with the lines in existence \textsuperscript{115}.

The telegraphic progress in the Punjab during the British period can well be understood from the following figures: up to 31 March 1869 there were 14 telegraph offices\textsuperscript{116} and their number rose to 953 in 1901\textsuperscript{117}. Excluding the abnormal increments in the years during which there was war with Afghanistan, a large and continued increase was observed in the number of messages every year. The total number of messages sent from telegraph offices in the Punjab during 1874-75 was only 45,670\textsuperscript{118} which rose to 645,005 during 1900-01. These statistics show that the telegraph had become quite popular among the people of Punjab.

Realizing full well the political, military, economic and social advantages that accrued from the introduction of telegraph system, the British Government under the Crown was anxious to extend the system throughout the country. Its presence was felt at the same time in every portion of the empire. But the British did not try to extend this facility to every nook and corner of this vast country. Only one in every 97 villages of Punjab till 1931 had the advantage of telegraph system offices\textsuperscript{119}. In opening the telegraphic office, the British were guided by imperialistic motives. Their opening was decided from the strategic point of view so that efficient transmission of message between important centres or stations could be made possible.

\begin{align*}
112. & \text{Ibid., 186-1877, p.105.} \\
113. & 118 \text{ miles in length; Ibid., 1878-1879, p.139.} \\
114. & 196 \text{ miles in length; Ibid., 1882-1883, p.203.} \\
115. & \text{Ibid.} \\
116. & \text{Punjab Administration Report 1868-69, (Lahore, 1869), p. 428.} \\
117. & \text{Ibid., 1900-01 (Lahore, MCMII), p. 113.} \\
118. & \text{Ibid., 1874-75 (Lahore, 1875), p. 86.} \\
119. & \text{Census of India, Vol.XVII, Punjab, 1931, (Lahore,1933),p.32.}
\end{align*}
As for the adoption of technology by Indian workmen, unfortunately technology transfer under colonial relations offered very little scope for such development. In fact almost all the machinery came packed from outside, often along with technicians to handle it. The characteristic British policy was to increase the productive resources of the country through the agency of imported technology. Whatever information Indians gathered regarding the making of some new form of technology was, therefore, a result of their own quest for it.

No doubt, railways brought much profit to British. But it was not easy to reach in the interiors of India without good roads. In fact, India was the only country in a position, owing to its soil, climate and population to supply the quantity and quality of raw materials the British needed. The latter had in their power to increase, almost indefinitely, the sale of their manufacture in India ‘by increasing communication between the interiors and the coastal’ 120. The difficulty of communication was so enormous that a major portion of the interior was of no value, as it was not connected with market121. Cotton was brought down to Bombay on the backs of bullocks. The expense, the loss of time, the damage by accidents of weather, and loss in bad packing were massive under the most favourable circumstances122.

Roads

In the Punjab, prior to annexation, the roads were in an appalling state. There did not seem to have been a mile of metalled road in existence. The Province at large had only rough earth tracks123. Roads in the modern sense, that is to say, embanked, well drained, with easy inclinations and hard smooth surfaces, allowing the use of wheeled traffic with a minimum of resistance, and

120. The Lahore Chronicle, May 17, 1851.
121. The Englishman, August 7, 1857.
122. The Lahore Chronicle, May 17, 1851.
carried by means of raised bridges over the water courses of country, were practically unknown in Punjab, until the appearance of the British. 

The Board of Administration introduced the macadamised roads in Punjab for the first time. The Board, immediately after the annexation of the Punjab, paid attention towards improving internal communications of the Province. The roads were considered as ‘the great veins and arteries of the body politic, as adopted either for the machinery of troops, or for commerce, domestic and foreign’.

‘Without good roads, wrote John Lawrence, we can never hope thoroughly to develop the resources of new possessions and enable the people to take advantages of the best marts for their superfluous produce’. Therefore, the Board began a massive road-building programme. The Public Works Department for 30 years managed practically all the roadwork. Keeping of old roads in good condition was another priority. Situation improved with the passage of time and road development progressed gradually and satisfactorily.

In the meantime the motor traffic had grown rapidly and had led to a demand for more and better roads. Motor transport became very popular with the short distance passengers, being cheaper and more convenient.

Of the numerous roads constructed, repaired or extended in Punjab under the British rule, the most important was the Grand Trunk Road. Starting from Calcutta, it ran through Northern India to Delhi and thence, in the Punjab, it passed through Karnal, Ambala, Ludhiana, Jalandhar, Amritsar, Lahore, Jhelum, Rawalpindi and Attock where it entered the North-West Frontier Province and ended at Peshawar, with a total length of 587 miles, metalled and bridged throughout. The first portion of the road, from Peshawar to Lahore, was

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124. G.W. MacGeorge, Ways and Works in India (Being an account of Public Works in that country from the earliest times upto the present day). (Edinburgh, MDCCCXCIV), p. 65.
127. Ibid., 1853-54, pp. 26-31, 45.
considered by Lord Dalhousie to be the most important because of its commercial importance and especially for its ‘military purposes’.¹³¹ Many difficulties were encountered in the course of its construction. Besides the natural difficulties such as rock, sand, flood, earthly strata, ravine and cliff, which were overcome successfully, the other difficulties were labour and material. Labourers had to be imported. They claimed higher wages. Material was often found to be very costly¹³². The total mileage of this road opened for traffic by May 1856 was 192 miles out of the entire length of 264 miles,¹³³ but this road was yet to be metalled. The Revolt of 1857-58 interrupted its construction as it involved huge expenditure ¹³⁴. But after that, the work on the road was, however, carried on vigorously and by 1864 the entire length of the road was metalled¹³⁵.

The second portion of the Grand Trunk Road, from Lahore to Ambala, comprised two routes, the one via Ferozepur and Ludhiana, which avoided the Beas altogether. It was important mainly from the military point of view. This route was completed before 1857. The other route passed through the important commercial town of Amritsar, crossed the Beas, touched Jalandhar and treaded its way over the Sutlej at Phillaur, meeting the former route at Ludhiana. The Beas to Sutlej section was reconstructed in 1858 and was best adapted to the military and commercial requirements of the country¹³⁶. This road was opened to traffic in 1861¹³⁷.

Many difficulties were faced on the third portion also, namely, between Ambala and Karnal. The innumerable streams, which ran through the tract, the stretch of sand, which often obliterated the lines of the road, and sand storms, posed as obstacles in the work of construction of the road¹³⁸. The road was

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¹³². Foreign Department, Miscellaneous, Series, S.No. 157, No. in the List 373, para 404.
¹³³. Ibid., Series, S.No. 157, No. in the List 364, para 81.
¹³⁴. Ibid., Series, S.No. 157, No. in the List 365, para 57.
¹³⁸. Ibid.
opened for traffic in 1856\textsuperscript{139} and this was a big achievement for the engineers under the existing circumstances.

Prior to annexation, Punjab was practically roadless and there was 'hardly a bridle path. But during the course of British administration, town was joined to town and village to village by the highways that ran out north, south, east and west, across rivers and canals, through jungle and desert. The British maintained many of the old roads, for example - the highroad following the alignment of the present Grand Trunk Road; it was extended from Delhi to Peshawar and a highway was constructed from Lahore of Multan, which constituted a landmark in the history of highway engineering and are counted among the 'greatest works of Asia'. In addition, many other roads were constructed in nearly all the districts of the Province as also in the valleys of Peshawar, Kohat, and Hazara in the Derajat and in the country south of Multan\textsuperscript{140}. The total length of metalled roads in the Province maintained by the Public Works Department during 1880 was 1,381\textsuperscript{141} miles, which rose to 1,477\textsuperscript{142}, 1,663\textsuperscript{143} and 2,757\textsuperscript{144}, miles during the years 1990, 1925 1935, and respectively. This mileage further increased to 4,622\textsuperscript{145} miles at the end of British rule in 1947.

The Punjab was thus extensively covered with a network of roads. The important roads were generally guarded at intervals by chowkis (posts); between the chowkis, stones, pillars and avenues of trees marked out the roads. Accommodation for travellers, such as servers, rest houses, dak bungalows, encamping grounds, supply depots, wells, tanks etc. was also provided along many of the roads.

\textsuperscript{139} K.M. Sarkar, \textit{The Grand Trunk Road in the Punjab}, p. 28.
\textsuperscript{140} Foreign Department, Miscellaneous Series, S.No. 156, No. in the list 356-59, para 342.
\textsuperscript{141} \textit{Punjab Administration Report} 1899-1900, p.168.
\textsuperscript{142} \textit{Ibid.}
\textsuperscript{143} \textit{Ibid.},1925-26, p. 75.
\textsuperscript{144} \textit{Ibid.}, 1934-35, p. 74.
The construction of roads proved beneficial for the government as well as for the people. It facilitated military transport. The Punjab was situated in between the North-West Frontier and the major parts of the British Empire in India. Through the Grand Trunk and other roads, the British authorities could transport soldiers and provisions for the army more easily and timely, and thus they were in a position to ensure greater security of the North-West Frontier. Apart from this, the Imperial Government could take prompt and effective action against the rebels and lawless elements. The roads helped in providing security to the life and property of the people. Another great advantage of the roads was that they helped in the development of trade and commerce in this region.

But it may, however, be observed that the roads in the Province in 1858 were in a crude and half-finished state\textsuperscript{146}. The work on the Grand Trunk Road was taken up in 1849\textsuperscript{147} but it could not be completed till 1886\textsuperscript{148}. Again, the state of rural communication of the Province was more backward\textsuperscript{149}. It can be fully realized by the fact that there were no roads in the villages at all\textsuperscript{150}. During the post-war period, the government planned to link every village in the province, which would be more than two miles from an all weather road\textsuperscript{151}. But this scheme could not materialise because of the independence of country in 1947.

While drawing the attention of the Government towards the backwardness of road communications in the Province, Sewak Ram, a member of the Punjab Legislative Council, Multan Division (Non-Mohammadan), Rural, said that the numerous roads in the Province were not metalled and as such it was difficult for the people to go from one district to another by unmetalled roads\textsuperscript{152}. He criticized

\textsuperscript{146} Punjab Administration Report, 1858-59, paras 41-46.
\textsuperscript{147} Ibid., 1849-51, para 337; also see K.M. Sarkar, The Grand Trunk Road in the Punjab, pp. 15, 20.
\textsuperscript{148} Ibid., 1887-88, para 106 also see K.M. Sarkar, The Grand Trunk Road in the Punjab, pp. 15, 35.
\textsuperscript{149} Public Works Department, Buildings and Roads, Branch, Administration Report for the year, 1923-24, p. 3.
\textsuperscript{150} Post-War Development Plan, Punjab, Lahore, 1946, p. 71.
\textsuperscript{151} Ibid., p. 72.
\textsuperscript{152} Punjab Legislative Council Debates, 4 March 1926, Vol. IX, No. 7 (Lahore, 1926), p. 375.
the Government on this account and said that many roads were getting into disrepair and means of communication had become very bad\footnote{Ibid., 6 March 1931, Vol. XVIII, No. 6 (Lahore, 1931), p. 352.}. Pir Akbar Ali (Ferozepur, Mohammedan, Rural) and Mohan Lal (North-East Town, Non Mohammedan, Urban) opined similarly that arterial roads in many places were in a bad condition, which required the serious consideration of the Government. Sardar Habibullah, a member of the Punjab Legislative Council from Lahore (Rural) pointed out that Government was spending a lot of money on building new bungalows for officers. Furthermore the financial methods of District Boards were such as robbing of Peter to pay Paul. It had been customary in the different districts of Punjab to make allotments for educational, medical and veterinary and other services and to leave the District Engineer to do what he could with the balance to maintain communications. The results of such a system of distributing finances to different services were that important lines of road communication remained incomplete for years for the lack of funds\footnote{Punjab Administration Report 1921-22, pp.xiii, 16.}. Even existing roads were in a very dilapidated and neglected condition. Maintenance seemed to be a major casualty in the District Board Roads.

However, during the year 1923, the gross expenditure on communications, increased. But this enhancement was not liked by some of the Punjab Legislative Council members. While discussing the budget for 1929, Ujjal Singh (Sikh urban) criticised the Government for spending much money on communications and advised the Government to spend it on beneficial departments such as education, public health, medical relief, agriculture and industries\footnote{Punjab Legislative Council Debates, 4 March 1929, Vol. XI-No. 10, (Lahore, 1929), p.605.}. But he did not offer any suggestion regarding the construction of new roads and the maintenance of old ones. Thus, his criticism was not very constructive. Gopal Das (Lahore and Ferozepur- cum- Sheikhupura, (Non-Mohammedan Rural) agreed with the views expressed by his fellow member (Ujjal Singh) that since the commencement of Reformed Government in 1921, there was a rise of 300 per cent in the expenditure on roads. But he did not
under-emphasise the importance of roads from the military and commercial point of view. He suggested that expenditure on roads should be treated as capital expenditure and not be met from ordinary revenue. Saving on this account could be spent on beneficial departments\textsuperscript{156}. Keeping in view the difficulties that passengers had to experience on account of the awful condition of roads, Rattan Chand commented that the Government should incur more expenditure on roads\textsuperscript{157}. Sayed Mohammad Hussein (Montgomery, Mohammedan) also expressed similar views \textsuperscript{158}.

Sikandar Hayat Khan and Zafrullah Khan (Sialkot, Mohammedan), while stressing the importance of good communications in the development of the resources of the Province remarked that if the Government could not afford to build too many pacca roads owing to the financial stringency, they should make up that deficiency by providing good kachha roads. They advocated the policy of having a much larger mileage of graded roads, before the Government could afford to have all the principal roads metalled\textsuperscript{159}. Reacting to the observations and remarks of various members, Jogendra Singh, Minister for Agriculture (Sikh), informed the members that the communications Board had then decided to push kachha roads and hoped to connect every village with a good motorable road within due time\textsuperscript{160}. This shows that Punjabis were showing too much interest in the development of \textit{pacca} roads.

But we find that despite the declaration of the Minister to provide village link roads, nothing substantial were achieved upto 1947 in this regard. The reason is not far to seek; firstly, the depression of 1929-30 and secondly the breakout of Second World War, did not leave any funds for such amenities. However, the idea of providing village link roads was appreciable. But the British were not serious about the development of roads. With the growth of railways an

\textsuperscript{156. Ibid., 1 March 1928, Vol. XI-No. 6, (Lahore, 1928), p.260.}
\textsuperscript{157. Ibid., 5 March 1929, Vol. XII-No. 11, (Lahore, 1929), p.628.}
\textsuperscript{158. Ibid., 4 March 1929, Vol. XII-No. 10, (Lahore, 1929), p.619.}
\textsuperscript{159. Ibid., p. 610.}
\textsuperscript{160. Ibid., 5 March 1929, Vol. XII-No. 11, (Lahore, 1929), p. 700.}
idea prevailed among them that roads were unnecessary and unprofitable; for this reason, they neglected road development in the second half of the nineteenth century. After that they constructed roads primarily to facilitate access to railway stations. The chief function of the roads, it was accepted, was that of feeding the railways.

Extension of irrigation was another agency through which civil engineering developed in India during the British Rule and it may safely be said that a great part of Punjab had been secured against famines by the construction of irrigation works by the British government. Behind the normal happy life of the early village community lurked the ever-threatening specter of famine. Famine in the Punjab was the inevitable accompaniment of economic conditions, which left the bulk of the people dependent on the soil for their means of livelihood. The produce of the soil depended almost exclusively on a short rainy season; and the rains were erratic and subject to violent fluctuations. It had been realised by the British that insurance against years of scarcity could be found in irrigation; therefore the importance of canals began to be increasingly felt by them.

Irrigation

As the extension of railways tends to lessen the acuteness of a famine, so the extension of works of irrigation tends to prevent it. Irrigation, it was observed, secured crops, increased produce, and averted famines in the years of drought; railways helped the conveyance of food to afflicted tracts in famine years. Therefore, side by side with numerous railway projects, the British Government of India undertook certain canal projects of great importance during

162. Memorandum on some of the Results of Indian Administration, (Calcutta, 1911), p. 61.
the second half of the nineteenth century\textsuperscript{167} and chalked out a definite policy of prosecuting the irrigation works as a measure to distress famines by the end of nineteenth century.

Irrigation in Punjab was eminently suitable for canals\textsuperscript{168}. 'The capabilities of the terrain of Punjab for canal irrigation', reported the first Administration Report, are 'notorious'. Intersected by great rivers; it was bounded on two sides by hills, whence poured down countless rivulets; the general surface of the land sloped southward, with a considerable gradient. These facts at once proclaimed it to be a country eminently adapted for canals\textsuperscript{169}. There were no good canals in the Punjab before the advent of the British. There did exist some canals\textsuperscript{170} which were constructed by various rajas, maharajas and their diwans, sometimes for the purpose of supplying water to the fountains and water-works at the royal gardens and sometimes for providing irrigational facilities to the agriculturists. Some attention had been paid to provide irrigational facilities in order to make the land more productive. Maharaja Ranjit Singh (1799-1839) was keen for the development of agriculture and he made efforts to bring more and more land under plough \textsuperscript{171}. Ranjit Singh perceived that until and unless the condition of the cultivators improved, there could be no development in general. Hence steps were taken to procure water for the crops from artificial irrigation methods. Ranjit Singh reconstructed the Hansli Canal; in the earlier part of the nineteenth century there were canals in almost all the Parganas of the Khalsa Raj. But the canals

\textsuperscript{167} Duke of Argyll wrote, ‘Our first choice ought to fall upon irrigation rather than upon Railways’. Railways in India Administration Report for 1872-73 (Calcutta, 1874), p.51. While expressing his view before the Select Committee on East India Finance, Lord Lawrence said, ‘it would be a good thing if canals were constantly constructed’. Parliamentary Papers, 1873. No. 354, Microfilm Reel No. 95 (NAI).


\textsuperscript{169} Punjab Administration Report 1849-1850 and 1850-1851, p. 133; also see Dada Bhai Naoroji, Poverty and Un-British Rule in India, p. 187.

\textsuperscript{170} Punjab Administration Report 1849-50, p. 133. The First Administration Report of the Punjab noted that ‘Nearly every district possesses flowing canals or else ruins of ancient water courses’.

under the rivers Satluj, Ravi, Chenab and Indus worked only during the rainy season. Irrigation from them was confined to small low-lying areas along the rivers and not the uplands, which formed bulk of the Punjab plains and required irrigation. The perennial canals were few in number. They were of very primitive type without permanent head works, head regulators, distributaries and uniformity of depth and breadth. The water for the irrigation even from these perennial canals was used by lift and not by overflow. The British at the time of annexation of Punjab found many such canals. In some parts of the province, they were in a serviceable condition; in other they had become silted and useless. The British made strenuous efforts to restore them to a working condition and to extend their scope of usefulness to agriculture. They gradually improved enlarged, regulated and maintained old channels and also constructed some new perennial and inundation canals; several canals, which had been dug by private agency, were taken over by the Government at their owner's request.

It was as a result of the establishment of British rule in the Punjab in the middle of the nineteenth century that canal irrigation works of great magnitude with permanent head works, head regulators, well-defined courses and extensive system of distributaries were undertaken. The people, deeply sensible of the value of these works, mutually combined with an unusual degree of harmony and public spirit, not only for the construction of the reservoirs, but also for the

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The canals constructed during the British rule in Punjab fell into two categories:

1. The perennial canals, with permanent head works, running all the year round;
2. The inundation canals, running only in the flood season and irrigating the low lands along the rivers.

The important major and minor irrigation canals built by the British in Punjab during the period under review were the western Jamuna Canal, the Sirhind canal, the Upper Bari Doab canal, the lower Chenab canal, the Triple Canal Project (Upper Chenab), Lower Bari Doab Canal etc. Other schemes were like Satluj Valley Project, Haveli Canal Project and Thal Project.

So, it may be concluded that the British started the system of regular irrigation of lands in Punjab. The people were no longer at the mercy of famines, thanks to the irrigational works and railways. Considerable progress was made in removing the worst consequences of an irregular rainfall. The surplus water running to waste in the great rivers was led to the fields of the cultivators by a network of perennial and inundation canals.

The progress of irrigation system built up by the British in Punjab can well be appreciated by perusing certain statistical figures. The total cultivated area in Punjab which by the time of annexation was 12.4 million acres rose to 21 million in 1868, 26.7 million in 1892-93 million 29 million in 1900-01. The canal

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181. *Census of the Punjab*, 1868 (Lahore, 1870), para 75, p. 16; Report on the Revenue Administration of the Punjab for 1900-01, p.5.
mileage (main lines), which was only 2,247 in 1881, reached 4,651 in 1901.\textsuperscript{182} The irrigated acreage similarly increased by leaps and bounds. The total area irrigated by canals had risen from 2,858,166 acres in 1890 to 10,456,658 acres in 1920, 13,530,787 acres in 1940,\textsuperscript{183} and 15,750,484 acres in 1945-46.\textsuperscript{184}

Nevertheless, the measures taken by the British for the purpose of irrigation were perhaps inadequate; the canal irrigation did not develop to an extent it was required. There were still very large areas, particularly in the north, southeast and west Punjab, which were dependent for their agriculture on scanty and often erratic rainfall and were badly in need of irrigation.\textsuperscript{185} After becoming the Governor-General of India, Lord Curzon wrote with regard to the Punjab, 'I am inclined to think that irrigation has been rather neglected and that we must give it a helping hand in future.'\textsuperscript{186}

It has been estimated that despite the canal irrigational facilities, 70 per cent of the available area for cultivation was lying waste, and only 30 per cent was used for productive purposes at the close of the nineteenth and beginning of the twentieth centuries. The percentage of area irrigated to the total area sown in Punjab during the year 1941-42 was only 39.56.\textsuperscript{187}

V.B. Singh opines that the niggardly policy of the British in respect of extending irrigation works was mainly responsible for converting one of the granaries of Asia into a land of perpetual famines.\textsuperscript{188}

\textsuperscript{182} Census of India, Vol. XIV, Punjab 1911, p. 52.
183 Public Work Department, Irrigation Branch, Administration Report for 1939-40, p. 111.
184 Ibid., 1951-52, Table C (concluded); see also The Famine Inquiry Commission, Final Report (Delhi, 1945), pp. 129-30.
186 Curzon to Hamilton dated February 2, 1899, see Hamilton Papers, Microfilm Reel No. 7 (NAI); also see Curzon to Hamilton dated 29 March 1900, see Hamilton Papers, Microfilm Reel No. (NAI); Curzon to Hamilton dated 16 March 1899, see Hamilton Papers, Microfilm Reel No.8 (NAI).
The British spent very little on the development of irrigational works. In 1880, 125 million sterling’s were spent on railways, which facilitated British trade penetration, in contrast to only 12 million sterling’s on canals, which were of vital importance for agriculture\textsuperscript{189}. Even by 1900, whereas the total amount spent on railways was £ 225 million, the amount spent on canals was only £ 25 million or one - ninth of the amount spent on railways\textsuperscript{190}. In 1898, R.M. Sayani, raising the matter in the Viceroy’s Legislative Council, complained: ‘While railways absorb so large a measure of government attention, irrigation canals, which are far more protective against famine, are allowed only three-quarters of a crore of rupees, or about one-thirteenth of the amount spent on railways each year’\textsuperscript{191}. R.C. Dutt severely criticised the Governor on this score. ‘When we turn from railways to the subject of irrigation works’, he wrote in 1903, ‘we turn from unwise extravagance to equally unwise niggardliness\textsuperscript{192}.

It may also be observed that the agriculturists had to pay heavy charges for irrigation, which were beyond the reach of the poor peasants, and added to the burdens on the peasantry\textsuperscript{193}. The water–rate (abiana) was almost equal in amount to the land revenue demand. It was admitted by government that ‘water-rates have never had any scientific basis of assessment’ and that canals were regarded as ‘ the most important source of financing the requirements of the province irrespective of all theoretical considerations’\textsuperscript{194}. Water–rate was even more inelastic than land revenue because Government was under no obligation to reduce it, no matter how low the prices. This was one reason that cultivation costs were so inelastic, because water rate added up to a sizeable portion of total costs. There were reports of peasants refusing to take canal water because

\textsuperscript{191} Abstract of the Proceedings of the Council of the Governor-General of India’s assembled for the Purpose of making Laws and Regulations (Annual), 1898, Vol. XXVII, p. 7.
\textsuperscript{192} Bipin Chandra, \textit{The Rise and Growth of Economic Nationalism in India}, p. 208.
\textsuperscript{193} R. Palme Dutt, \textit{India Today}, p. 223.
\textsuperscript{194} Government Review of Report of Abiana Committee1934 ,paras 17and 18 quoted in Darling Papers I/21.TS,Notebook,CSASA.
they could not afford to pay the high water charges. Besides water rate could be enhanced at any time, there being no fixed period of settlements in the case of land revenue. One such attempt at increase, in 1924, threatened to produce a major agitation which was averted by timely concessions and adept political maneuvers involving the 'Zamindar Party' on the part of Malcolm Hailey, the Governor of Punjab, who recommended well the lessons of the 1907 agitation and was unwilling to let the history repeat itself.

Raising this point in the Punjab Legislative Council in March 1932, Ch. Allah Dad Khan, argued that in the United Provinces the cost of maintaining and running canals was as much as it was in the Punjab and yet in the United Provinces, abiana had been reduced by about one-fourth and in some cases even one half, whereas no reductions had yet been made in the Punjab. Carrying this point further, Muhammad Hayat Qureshi emphatically held that the government should not try to make profits on their capital as they had not to pay any exorbitant rate of interest and all the canals were paying profits, most of them had long paid back the capital invested on them. The combined demand of land revenue and water rate was not something the ordinary farmer could pay with ease. At least one-third of the cultivated area paid both these charges. Thus securing for government a double advantage by way of increase in revenues from both these charges. To pay these, the cultivator often shifted to cash crops even when these resulted in shortages in other necessary crops, when he could not manage to pay at all, he turned to the moneylender. Townshed, the Commissioner of Jullunder Division, in a letter to Hailey commented on the sudden increase in cultivation of cotton in Fazilka and other tehsils said that this is resulting in a shortage of fodder as less area is devoted to it, but it is a good

196. Hailey Papers, MSS Eur, E-220/6 (a); E 220/6 (b), f163 and f277; E220/6c, f 349; E 220/6 (c), f 438.
sign because it has enabled the people to pay the land revenue\(^{199}\). Nor did the irrigational canals succeed in alleviating the cause of famines. The Province of the Punjab had to face crippling onslaughts of various famines from time to time. There was a grievous famine in 1860-61\(^{200}\). During the twentieth century also Punjab was visited by numerous and frequent famines spanning during the years 1901-03, 1905-06, 1910-12, 1914-15, 1916-18, 1920-23, 1929-31 and 1938-40\(^{201}\).

**Agriculture**

The development of irrigation and introduction of high yielding varieties combined with the expansion of railways and metalled roads commercialised the character of agriculture in Punjab\(^{202}\). The railways linked the agricultural regions in the interior of the province with big ports and cities in India and created large markets for the surplus produce of the Punjab. It led to a shift towards cultivation, and helped the peasants to reap high profits. With irrigational enhancement, the process of agricultural improvement was also started by the British. New varieties of crops suitable to the climate and soil of Punjab were introduced. In the early 1850s experiments were made in various districts among others with Egyptian wheat, New Orleans cotton, Otacheite sugarcane, flax, tobacco, marigold, turnips and clover. The first step in agricultural development in the province was the establishment of experimental, seed and demonstration farms in canal colonies and other districts.

Organisation of the Department of Agriculture in Punjab in 1906 was a landmark in the history of scientific agriculture in the province. Another milestone was the opening of the Punjab Agricultural College, at Lyallpur in 1909, which

\(^{199}\) Hailey Papers, MSS Eur E220/9(a), f 41-2.

\(^{200}\) Punjab Administration Report 1860-61, paras 53-54.


subsequently became the chief center of agricultural education. In addition to teaching, with a library, a herbarium, a museum and chemical, botanical, entomological and other laboratories, Lyallpur Agricultural College became the agricultural capital of Punjab. By 1931, the research department of the Agricultural College, Lyallpur had experimental farms at Lyallpur, Gurdaspur, Hansi, Jullundur, Montgomery, Multan, Rawalpindi and Sirsa. On these farms, work in connection with the testing of relative merit of different types of crops, selection of seeds, evolution and testing of new implements as well as research in connection with the rotation of crops was progressively conducted. Investigations were also carried out on the control of pests and diseases of various crops. As a result of the work done in the botanical section on these farms, a marked success was achieved in the evolution and introduction of better varieties of crops, which brought higher yields and additional income to growers.

To revolutionise the existing system of growing was not an easy task. In the beginning, cultivators were reluctant to adopt any new line. Various methods adopted by the Agriculture Department which explained and demonstrated to the farmers the results of investigations carried out on its experimental farms. The work was carried out in a number of ways:

Firstly, by means of demonstration plots on the peasant's lands demonstrating the advantage of improved varieties of various crops, implements, methods of cultivation, use of manure, protection against pests and diseases, etc.

Secondly, by exhibitions on occasion where a large number of peasants gathered such as cattle fairs, and ploughing matches were held on these occasions where the District Board concerned offered prizes.

204. District Gazetteer, Muzaffargarh, 1929, p.128.
Thirdly, improved implements were lent out to farmers who wished to try them by themselves. In many cases, the cultivators bought them at the end of the trials.

Fourthly, the staff of Agriculture Department on their village tours gave popular lectures\(^\text{205}\).

Fifthly, bulletins were issued giving price, sources of supply and special advantages of each seed and implement tested and approved by the Agriculture Department\(^\text{206}\).

Sixthly, Agriculture Associations and Farmers Associations were organized to take the cause of the scientific agriculture\(^\text{207}\).

The increase in manufacture of implements, particularly made of iron, made the beginning of mechanisation of agriculture in Punjab. Mechanisation here means the performing of certain agricultural operations with the help of suitable machines. Broadly speaking, it had two forms: mobile and stationary. The mobile type mechanisation attempted to replace animal power on which agriculture had been based for many centuries. In this category came tractors for ploughing and harrowing and oil-engine or electric motor driven tubewells for irrigation. Here, only the beginning was made by the end of British rule, their use was confined to government farms and to those of a handful of wealthy agriculturists. The agriculture department of Punjab purchased two tractors in 1920s. Similarly, the total number of tubewells for example, in Jhang district by 1929 was only nine\(^\text{208}\). The Amristar Tubewell Scheme was started in 1911 by 1947 in Indian Punjab there were fifty tubewells working with electric motors\(^\text{209}\).

\(^206\). Punjab Administration Report 1908-09, p.20.
\(^208\). District Gazetteer, Jhang. 1929, p.113.
Another method was lifting of canal water by mechanical means. Both tube well and lift systems depended on the generation of electrical power, without which water could not be raised. A significant extension of such irrigation facilities was severely constrained in Punjab during the British rule by the absence of any large-scale development of electrical energy. Government at Mandi established only one large plant, which was too distant to provide electric energy to the whole of Punjab. The government itself did not establish power stations and tubewells, but instead utilised proxies for this purpose, requiring such services from individuals as a condition for obtaining colony land. The foremost personality involved with lift irrigation methods was Rai Bahadur, an ex-government engineer who took up large areas of land on lease in canal colonies. He installed his own hydroelectric plant and provided lift irrigation to his land successfully at Buchiana land in Lower Bari Doab Colony. The normal tenure of these leases was three years, after which the government took possession of all land, pumping plants, and other installations free of cost. Despite such onerous terms, Sir Ganga Ram was able to make handsome profits near Renale in Lower Bari Doab Colony. Ganga Ram undertook to build a full scale hydroelectric power station to provide lift irrigation to the leased area and surrendered to the government once again all the land and installations at the expiry of the lease period. While Sir Ganga Ram obtained only transitory benefits from his enterprise, a family of Syed Pirs in the vicinity enjoyed more permanent gains. Despite Sir Ganga Ram's protest. They persuaded the government that he should share irrigation from his lift work with them. Such an approach of the government seemed to outlast that of the man who had pioneered these innovations. Later for the promotion of tubewell technology, the government again involved individuals. Sir Ganga Ram again came forward and proposed to develop 50 tubewells and demanded 5000 acres land at Kuthiala to be leased to him. The lieutenant-governor, at that time, Sir Michael O'Dwyer, was not well disposed towards commercial enterprise and inspired the government's uncompromising stand. Sir Gaga Ram ceased further efforts with tubewell leases, and the entrepreneurial ability, financial resources, and technical expertise of this talented man went unutilised. Later Nawab Zulfiqar
Ali Khan and Raja Daljit Singh, from the ruling families of the Princely states, of MalerKotla and Kapurthala, respectively, attempted this venture and the Kuthiala venture proved to be a complete failure. The leases incurred serious losses and could only construct three or four tube-wells instead of fifty promised by Ganga Ram. Thus tubewell irrigation achieved only embryonic development in Punjab during the British rule.

The mechanisation of agriculture in the pre-independence Punjab was the other area where British introduced their technology. It aimed at reducing the drudgery of certain operations, which had to be performed either by human labour or by a combined effort of human beings and animals. Assured of the benefits, the Punjabi Agriculturists enthusiastically purchased new implements of both Indian and foreign manufacture for the improvement of cultivation. The increasing manufacture and use of sophisticated and more efficient implements, particularly made of iron, marked the beginning of the mechanisation of agriculture in the Punjab. In several cities like Amritsar, they were manufactured in large quantities. The use of new implements in Punjab witnessed a marked advancement particularly of fodder-cutters, sugarcane-crushers, iron Persian wheels, iron ploughs and to a lesser extent of other implements. This is truer of the early twentieth century. In 1931, for example, a large number of improved implements of Indian manufacture like Meston ploughs 6,658 sugarcane-crushers 4,996; fodder-cutters 12,211 and Persian wheel 439 were sold in Punjab.

The peasants started placing greater area under more remunerative crops like wheat, cotton and oilseeds. Though the total area of cultivation in Punjab reduced in 1901, yet the area under these crops showed spectacular increase. For example, in 1876 the area in thousand acres under oilseeds was 188, cotton

668 and wheat 6609. In 1921, it increased to 1172, 1540 and 8951 respectively.212

Generally speaking, in the early twentieth century the market purposed, and determined the extent of area under various crops, and the subsistence state of cultivation was confined only to the remote and hilly areas where the means of communication were not much developed213.

So, the enthusiasm among the peasants played an important role in the increase of agricultural production in the Punjab. They showed a more responsive aptitude for the application of latest scientific and technological innovations. Their aptitude initiated a process of modernisation in agriculture that became intense in the post-colonial decades of the twentieth century. All their moments marked an evolutionary stage in the modernisation of agriculture and went a long way in increasing the agricultural produce and prosperity of Punjab.

Sir Ganga Ram, being an agriculturalist at heart, struggled to revolutionise the economic conditions of Indian agriculture and to bring home the fruits of European science against a bureaucracy instituted to yoke Indian economic growth to the demands of the metropolitan economy. Sir Ganga Ram made a vast tour of the agriculture centres in England and on return, he said to himself that 'the problem of India is the problem of water' as he thought of the position of the agriculture in India's national economy. 'Engineering skill', he would say to himself, 'can move mountains, and the question of the water is an anthill compared with what we can really do'214. He launched a tirade against Mahatma Gandhi's gospel of re-building Indian economy and agriculture through hand-spinning with the charkha — which 'he thought was fit only to be burnt as firewood'. His practical disapproval of swadeshi politics, and his scientific solutions to the question of Indian poverty, demonstrates a grasp of details,

which when counterpoised to the emancipatory narratives of Hindu and Muslim nationalism, reveals the hollowness of nationalist politics in colonial Punjab and elsewhere in India. He made a far-reaching proposal to the Indian Industrial Commission in 1920 to abolish the land revenue settlement in Punjab. He shrewdly drafted representations on policy commissions of the British Indian government, and made frequent pleadings to the Anglo-Indian political community which reveals that his philanthropy was inspired by a radical politics of reform, which was deeply immersed in a faith in the potential of modern science to transform human societies. His numerous visits to England to observe the latest techniques in industrial agriculture, and his several technical innovations in agricultural technology underpin his politics of reforming Indian society by modernising agriculture and industry. Rather than seeing the Indian peasantry as an old-fashioned and inert mass, symptomatic of India’s historical inertia, Ganga Ram dreamed of transforming the Indian peasantry into ‘a new generation of men, who would understand a machine as they now understood a bullock’.

Electricity

Another important technological project was the production of electricity. In the first decade of the twentieth century, the only source of street lighting was the kerosene-oil-lamps. With the expansion of the town, demand for modern amenities increased\(^{215}\). In 1912, government of Punjab issued license to ‘Lahore Electric Supply Company’ for generating and selling electricity. Across the river Ravi, company established a Steam Station and started selling electricity in 1916\(^{216}\). The engineers of Messer’s Walter Lock and Company Limited, Lahore prepared a scheme of introducing electricity in the town in 1916. Rai Sahib Lala


Badri Das and Lala Dev Raj paid Rs. 200/- each to meet the expense of the scheme. The Kerosene-oil-lamps were replaced with electric-light-points.

In the beginning, people were afraid of using electricity and were not prepared to use it for domestic, commercial and artistic purposes. They were encouraged to use electricity by giving them demonstrations of how electricity can be useful to them at night. In the beginning, the government suffered a great loss due to less production and consumption of electricity by the people. General opinion of the people about the use of electricity was not favourable. Because people were afraid that electricity could cause any accident to them. So, they preferred to use oil-lamps and ghee, which had been in use since ancient time. Later on, the government provided licenses to Municipal Committee of Lahore, Amritsar, Simla, Jullunduar, Multan, Rawalpindi and Gujranwala to generate and sell electricity in 1915, 1917, 1921, 1922, 1923, 1925.

Industries

Technology was also introduced in the industrial field. In 1850 there was no large-scale industry in Punjab worth the name, the cottage industries, however, flourished. Modern industrial technology was introduced in India by the British, at the outset in the field of textile, the reason being the closure of its supply of raw cotton from America after the war of independence in America, so they had to concentrate on India. But they found the cotton staple imported from India inferior to that of American cotton.

The cotton which sent to England by British from India was impure and dirty. Because the ginning and packing of cotton performed by Indians with their coarse implement was much more prone to impurities. The process also consumed considerable time and manual labour. Therefore, to ensure the supply of finest cotton, the British made some attempts to introduce packing screws and

new cotton cleaning machines in India. They introduced the packing cotton screw named as ‘geometrical cotton screw’. This device reduced the employment of human hands to a large extent and also saved considerable time.\textsuperscript{221}

Under British influence, textile industries became most important in the province, in 1911. Cotton weaving, and spinning were the largest of the textile industries where formally a hand-ginning machine, called the Belna had been used. There were new modern ginning factories in Punjab. Powerloom Weaving demonstration factory was also established in the province at Shahdra in 1928 with the object of giving instructions in the art and practice of Powerloom weaving, both to men of education and professional weavers.

British also introduced wool-cleaning machine. The new Edgerton woolen industry was established at Dhariwal. During the year 1927-28, government organised a demonstration train. There were two carriages, one for the display of exhibits and the other for practical demonstration. The demonstration train attracted large crowds. The technical officers toured the state, giving technical assistance to the persons engaged in the work, for instance the Oil demonstrator toured the province with a view to advising and helping persons engaged in oil pressing\textsuperscript{222}. Several oil mills were established in various towns and cities like Lahore, Delhi, Jullandhar, Lyallpur, Amritsar, and Sargodha. The famous Attock Oil Company was established which started the production of oil.

This, industrial activity was geared to rural economy as sugarcane had come to be regarded as the most profitable cash crop; a modern sugar mill at Sujanpur was established\textsuperscript{223}. The prospects of soap industry had also become bright; many people Khatri's to Tellies had begun to show interest in this industry\textsuperscript{224}. There were 25 factories in Multan. Soap was being made in every

\textsuperscript{220} \textit{The Calcutta Journal}, November 24, 1818.
\textsuperscript{221} Ibid.
\textsuperscript{222} Punjab Administration Report, 1933-34, (Lahore, 1935), pp.63-64.
\textsuperscript{224} Ibid., p.189.

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town of influence. The Khatri and the Aroras dominated the industrial panorama of Punjab. Among the industrial entrepreneurs, the giant was Lala Harkrishan Lal. His industrial empire comprised such diverse ventures as banking, insurance companies, soap making, brick kilns, saw mills, ice factories, oil pressing, timber making, glass making, match making as well as spinning and ginning mills. Lala Harkishan Lal’s relatives with his help and encouragement also set up industries\textsuperscript{225}. His brother Daulat Rai launched nine industrial enterprises\textsuperscript{226}.

Steam power began to be used in factories, for example Silk Filter factory at Amritsar, Power bricked factory, lime-grinding works at Gujranwala and Gujarat were all worked with steam power. All factories manufacturing sports goods in Punjab province belonged to Khatris, and so did the only hosiery factory. They also owned 25 brick and tile kilns, 6 tea factories, 5 printing press, 17 cotton-ginning factories and 8 Food Industries, as well as the sole cigarette industry located in the region. The Aroras owned 23 Textile industries, 12 food industries, 11 brick kilns and 3 printing presses. The Sheikhs owned 2 out of 3 leather factories and had 14 textile industries, 3 printing press\textsuperscript{227}.

Use of ready-made clothing was on the increase in cities. Boots, shoes, socks, hosiery, hair ribbon, trousers, strings, turbans, hats, caps and other items like umbrella, soaps, perfumes, tooth powder, were manufactured. There was also demand for metal objects, including steel trunks, sewing machines, compresses and other machinery, scissors, hinges, locks other household items etc. The railroads running through all the prosperous tracts had been a factor in changing the outlook of the people. Small railway stations were also exporting centres and factories had been established in out of the way places or in the vicinity of railroad\textsuperscript{228}. Tailoring had also changed to a great extent, many tailors now had sewing machines, and the sewing of ordinary clothes in the towns had

\textsuperscript{225}Shyamla Bhatia, \textit{Social Change and Politics in Punjab}, p. 75.
\textsuperscript{227}Shyamla Bhatia, \textit{Social Change and Politics in Punjab}, p.76.
\textsuperscript{228}Ibid., p.191.
shifted from the home to the shop in many cases. In Lahore, there were 8 clothing factories in 1911229.

With a view to provide financial assistance to the persons interested in the industrial development, the Punjab government made provisions for the distribution of loans of rupees one lac under the Punjab Industrial Loan Act, loans were to be sanctioned to the industrialists and cottage workers of the province. However the response of the people to this policy was poor and during the period 1926-27 only Rs, 30,000/- were granted as loans, but steadily this policy gained momentum and in the year 1933-34 Rs, 62,000/- were granted as loans and in the year 1934-35 Rs, 95,000/- were granted as loans 230.

The most important person who took personal interest in the industrial development was Sir Ganga Ram who devoted hours of thought and study to the problem of factory. He was fully alive to the close link that binds agriculture and industry and he recognised them as the twin pillars upon which stands, delicately balanced, a nation's prosperity. By degrees he gained such a mastery over his subject that he was called on by the Industrial Commission of 1918. He put forward suggestions which, in the light of twenty years of subsequent industrial development, have proved eminently practicable. With vast scope and minute details of his suggestions, he proved his extraordinary ability. One of his suggestions was that the ginning factories should be controlled by the State. Another was that, the government should be given charge to set up cottage industries, indigenous banks, and cooperative marketing machinery. In putting forward the suggestion of reciprocal trade rights between England and India, he anticipated the Ottawa Agreement by more than a decade231.

As a practical industrialist, he also acutely realised the lack of skilled labour in the country. In his search for efficiency, he was always on the look-out

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for new and sensible methods of education. He also saw the bad effect it had on artisan's children to get ordinary primary education, which simply caused them to shun their parental profession and take to government employment on posts such as Chaprasi or forest guard. He advocated the adaptation of education to the needs of the working classes, and was of the opinion that drawing and use of scales at least should be taught as this 'goes a long way towards opening a workmen's mind'\textsuperscript{232}. Sir Ganga Ram had one great belief and he expressed it forcibly: 'The entire question of the country's emancipation is hinged upon the stomach of the masses, which at present is empty. Everything gravitates around it, and the remedy lies in the industrialisation of the country'.

During this period (1849-1947), some efforts were made for the development of industries by residents of Punjab. However, despite such efforts, the condition of industry in the province remained far from satisfactory. The money that the government was spending on the encouragement of industry was extremely small. Even the little money that was being spent was not utilised to the best purpose. For instance, weaving was so popular in Punjab that almost every housewife and every girl in the house used to spin. With the dowry of every newly wed bride, a spinning wheel was presented by the parents\textsuperscript{233}.

No doubt, some efforts were made to give technical knowledge to the young men through the technical schools. However, the expert knowledge provided by these schools was not enough. A scrutiny of the history of the industrial development of any other country, for example, Japan and Germany, reveals that the governments of those countries sent out scores of their young men to foreign countries to receive technical education. This observation made by Dr. Gokul Chand Narang, \textsuperscript{234} (the foremost industrialist of the province) showed interest in the development of industries during British regime. He

\begin{footnotesize}
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\item \textsuperscript{232} Ibid.
\item \textsuperscript{233} Ibid., Vol. IX 1926, p.1646.
\item \textsuperscript{234} Punjab Legislative Council Debates, Vol. VIII, 1925, p.509.
\end{itemize}
\end{footnotesize}
began with one Sugar mill, and was later acknowledged as India’s Sugar King. Sir Manohar Lal (Finance Minister in Punjab Government) believes that unless industrialisation in India proceeds rapidly and surely, the country is likely to be left behind in the race of progress and may never be able to catch up with the industrialized world. He is of the opinion that heavy industries, particularly metallurgical industries, should be seriously developed if India is to lay the foundation of any genuine progress. He thinks that the fashionable emphasis on spinning and cottage industries may be helpful in developing character, but he is quite clear that, those who emphasis on spinning and cotton industries may be helpful in developing the character, and at the same time making clamorous demands for rapid constitutional advance or independence, know not what they are talking about. Without real industrialisation, he further added there could be no real political advance because an essential factor of strength in the nation’s life would be wanting, and there certainly could be no lasting independence as there would be no adequate capacity for defense. The main problem before the country, he thinks, is industrialisation at least to the extent of what is known as balanced economy.

Other Punjabi who showed much interest in the development of industry was Lala Harkishan Lal who laid the beginning of a great Industrial awakening in the land of five rivers. Among the several companies promoted and organised by him were the Punjab Cotton Press Company Limited, The Peoples Bank of India, Ltd. The Amritsar Bank Limited, The Cawnour Flour Mills Limited and various Soap factories, Brick Kilns, Saw Mills, Ice Factories and Laundries. He also ran electric supply companies (rapidly making immense profits), timber, coal, machinery and stores. He controlled resources that possibly equalled the combined resources of half of the states in northern India. His mills gave employment to thousands of labourers and others including highly paid European managers, and Indian staff drawing well over a thousand rupees per mensum.

236. Ibid., pp.200-201.
He made every possible effort to commercialise and industrialise Punjab. R.B. Saran Das, was another Punjabi who started the first spinning and weaving mill in 1897 its foundation stone was laid by Sir Dennis Fitzpatrick, the then Lieutenant-Governor of Punjab.

Anjuman-i-Punjab, the society that was established for the promotion of indigenous literature and education, also worked for the promotion of the industry in the province. It established Industrial Society, which dealt with the problems of adoption of new techniques in industries of Punjab. This shows that the response to the new industrial technology in Punjab was positive. But the industrialisation process was very slow. One of the other reasons for the slow industrialisation in Punjab was the limitation of industry to the production of requirements imposed by the geographical conditions. Punjab was at a vast distance from the sea, and at a disadvantage in supplying distant markets at the terminations of cheap lines of transport. The sources of power were not enough, as in other areas, nor had oil, coal or waterpower been fully utilised for industrialisation. Punjab was surrounded on three sides by countries that were sparsely populated thus unable to provide large markets for its industries, the fourth side adjoined the united provinces which had similar means of production, the only feasible markets seemingly were its own or distant markets. One effect of the isolated condition of Punjab was that machinery had to be repaired within the province, and this created a need for skilled mechanics and extensive repair shops. In 1921, the demand for industrialisation was seen as stemming from those seeking to utilise capital and from those whom the British Called ‘the middle classes’ seeking employment outside the crowded literary professions. There was scarcity of labour in Punjab. Much of the labour required for the industries was drawn from other provinces. One-third of the factory workers came from Rajputna and Central India. The industrial development is dependent

237. Ibid., p.162.
238. Ibid., p.157.
239. Ibid., p.253.
on sound finances, but the Punjab industry suffered from lack of finances and knowledge of business principles, which formed the basis of European and American industrial systems.

Medical Technology

Prior to the establishment of British rule, the medical system in the Punjab and India was of indigenous type and drugs were prepared from herbs. The health administration concerned itself generally with the relief of suffering. During Maharaja Ranjit Singh’s reign, there was no scope for the progress of modern medical system because he was afflicted with ‘highly hypochondriac tendencies to accept the western treatment’. British had to introduce medical technology in India because in the wake of speedy conquests, there arose pressure to establish hospitals at military stations.

The British rule represented a new conception of governance in which the state in principle assumed the responsibility for public health. There was a growing desire among the natives for English medicine and medical treatment. Keeping in view the fact that the indigenous systems of medical treatment did not at that time deal with such vital aspects of medicine as obstetrics, gynecology, advanced surgery and some other specialties, the western system of medical treatment can be regarded as a legacy of the British to the people of Punjab.

As there was no proper system of medical relief at that time, the newly introduced western system found its way amongst the people and was welcomed by them. From 1867 onwards there was a steady progress in the establishment of dispensaries and they were set up at almost all important stations in Punjab like Hissar, Gurgaon, Ambala, Ludhiana, Amritsar, Montgomery, Lyallpur, Attock.

and Shahpur etc.244 Besides dispensaries, many hospitals were built in important towns and cities of Punjab. There were 111 hospitals in the Punjab at the end of year 1940.245 The most important feature of the different hospitals established by the British was the installation of x-ray plants. The new plant comprises shock proof diagnostic machines incorporating all the latest improvements for up-to-date methods in diagnosis and treatment.246 Other important medical technological work was the opening of clinical laboratory where specimens of blood and urine were examined.247 Bacteriological laboratory for the examination of clinical material were established.248 There were also special arrangements for the electric treatment.249 For Dental diseases, conservation treatment given included fillings, scaling, root treatment, fracture of jaws and x-ray treatment, artificial dentures etc.250 Metallurgy laboratory and gas plants were also installed in various Dental Hospitals.251 A number of research projects have been undertaken dealing with dental caries, dietary deficiencies, and fluorine intoxication and papers on the subjects of ‘Chronic Endemic Caries’, and ‘the Incidence of Dental Caries’ in the Punjab were published in the British Dental Journal and British Medical Journal.252

New treatments started by British government were of immediate use to their military personnel. As Tuberculosis patients were admitted to the military hospitals, more work began to be done to fight this disease. A Blood Transfusion Service was started to meet the demands of British troops overseas.253 To meet the growing demands of military, many native doctors were given training to use

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244. Annual Report on the Working of Hospitals and Dispensaries in the Punjab for the years 1939, Lahore, 1940, p. 3.
247. Ibid., p. 32.
248. Ibid., p. 74.
249. Ibid., p. 31.
250. Ibid., p. 63.
251. Ibid., p. 64.
252. Ibid.
western modern technology. It was gratifying that Punjab led other provinces in providing the largest number of medical men and technicians for the army during the Second World War254.

Various operations now began to be performed in the hospitals with great surgical skill. There were operations on tumors, and cysts, blood transformation, operations on bone and joints, thyroid gland, stomach, liver etc. It is interesting to note that Punjab led all other provinces in the total number of surgical operations particularly for disease of eyes255.

The important centres for medical excellence were Eye Centre Karnal, Punjab Dental Hospital Lahore, Civil Hospital Batala, Civil Hospital Jhelum, Victoria Jublee Hospital Jullunder, Civil Hospital Lyallpur, Civil Hospital Montgomery, Victoria Jublee Hospital Amritsar etc256. Other important hospitals were the Mayo Hospital at Lahore, which provided scientific treatment on up-to-date lines for all classes of patients especially on the surgical side. The Hospital had surgical, ophthalmic X-ray and Electro-Therapeutic Departments257. There was also a small quantity of radium, viz.71m.gm available for the treatment of such cases. It had maintained its popularity both as the premier institution for the treatment of the sick and for providing efficient clinical material for the practical training of the students of the King Edward Medical College, to which it was attached258.

The Dental Hospital, Lahore was the only institution of its kind in India. It was an out-door institution and provided adequate facilities for the treatment according to modern methods, to patients suffering from dental disease259. It

254. Ibid. p.1.
256. Ibid. 1938 (Lahore, 1940), pp.59,63,71,73.
258. The Tribune ‘Letters to the Editor’, 18 January 1930, p.11.
supplied a long felt want and placed expert dental treatment at the hands of fully qualified dental surgeons within the reach of all\textsuperscript{260}.

The Lady Atchison Hospital, Lahore was a purdah hospital, which provided efficient medical aid for women by doctors of their sex and was deservedly popular among all classes of the public. The hospital also gave midwives practical medical training and provided them with good boarding and lodging\textsuperscript{261}.

The Lady Willington Hospital, Lahore, was another popular obstetrical and gynecological hospital of the province and a teaching institution for the training of students of the King Edward Medical Hospital College, Lahore. Nurses from the Mayo Hospital were also trained in midwifery at this institution.\textsuperscript{262} The Civil Hospital, Amritsar was known for the surgical work done there and formed an excellent training ground for the teaching of students of the Medical School, Amritsar, on the clinical and practical side\textsuperscript{263}.

The Victoria Jubilee Hospital, Amritsar was the second largest hospital in the province for the treatment on modern scientific lines of the large number of patients suffering from serious diseases. The Hospital had surgical department, eye, ear, nose and throat (E.N.T.) department, venereal, x-ray, dental, obstetric and gynecological departments. Surgery done at this hospital compared well with those done in other similar institutions. The hospital had maintained its reputation as an eye centre\textsuperscript{264}. The Memorial Hospital Ludhiana was the largest hospital in the province and was exclusively reserved for women and children\textsuperscript{265}. It was

\begin{footnotes}
\item[260] The Tribune, 14 March, 1930.
\item[262] Report on the Working of Hospitals and Dispensaries in the Punjab for the year 1941, p. 32.
\end{footnotes}
opened in 1899 266. The Church Missionary Society aided by grant received from the government and certain district boards and municipalities maintained it 267. Besides, there was a Civil Hospital in Ludhiana, which was founded in 1853. The Charlotte Hospital, also in Ludhiana, was opened in February 1889 268. The Ripon Hospital, Simla, was one of the important institutions of the medical department, it was the summer headquarters of the government of India and the Punjab government. The special feature of the hospital was that it provided accommodation for paying patients also. Besides the above-mentioned hospitals, there were also Infectious Diseases Hospitals in some towns of the province 269.

The increase in the number of hospitals and patients treated was a clear indication of the growing popularity of the hospitals and dispensaries and increasing appreciation of the facilities afforded therein by the population270. The allopathic system of medicine became very popular and there was an increasing tendency among the people of Punjab to avail themselves of the modern facilities provided for them in hospitals 271. Some people were so impressed by the services of the hospitals that they provided handsome money for the construction of new hospitals while some donated money for operating new departments.

The people were becoming more and more alive to the necessity of detecting, controlling and curing tuberculosis. Some philanthropist made handsome contributions for fighting this scourge. At Amritsar, Rai Bahadur Sir Gujjar Mal, donated Rs. 40,000 to the Tuberculosis Hospital and Rs. 5000/- for an x-ray apparatus in that hospital 272. Lala Tirath Ram donated Rs. 50,000/- for

268. Ludhiana District, 1904, p. 225.
272. Ibid .,p.4.
the provision of the Radium institute in the Mayo Hospital Lahore. Many people responded well to the establishment of new hospitals. Rai Bahadur Gujjar Mal had donated Rs 60,000 for the construction and equipment of the Tuberculosis Hospital, Amritsar. Rai Bahadur Jodha Mal Kuthiala had also offered Rs 45,000 for the establishment of a Tuberculosis Sanatorium near Hoshiarpur city. Rs 1,000 were donated by Dewan Somer Nath, P.C.S., General Assistant, Dharamshala, for the Women Hospital, in Dharamshala. Lala Jaishi Ram donated Rs 500, for the extension of the Women’s Hospital at Dharamshala. In Civil Hospital Amritsar, a car had been placed at the disposal of the civil surgeon, Amritsar, by the St. John Ambulance Association Punjab Provincial Branch, for the convenience of patients living in far off areas. A car had proved to be a great help and the facilities had been much appreciated by the people.

The British authorities set up many hospitals and dispensaries for the relief of ailing persons. There was a remarkable progress in all directions of public health. The number of hospitals and dispensaries had increased from 69 in 1866 to 267 in 1900, it further rose to 640 in 1925.

The number of hospitals and dispensaries increased to 1,055 in 1945. The number of persons attending them also increased steadily every year. The number of patients treated in 1860 was 181,005 which rose to 16,767,773 in 1941. These figures show a growing appreciation of the dispensaries.

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278. Ibid., 1899-1900, para 19.
In order to bring medical relief within easier reach of the rural population, the government adopted a scheme of subsidising private practitioners to encourage them to settle in villages. Many subsidised dispensaries were established\textsuperscript{282}. It is a first serious and systematic attempt to carry modern scientific medicine to the vast population of the rural areas. The increase in the number of patients treated is a clear indication of the growing popularity of the hospitals and dispensaries and increasing appreciation of the facilities afforded therein by the population\textsuperscript{283}. The allopathic system of medicine became very popular, there was increasing tendency among the people to avail themselves of the modern facilities provided to them in hospitals and dispensaries. However, this does not give a full indication of the suffering in the province as most of the sick preferred to be treated at their homes and others were treated by vaids and hakims and some for one reason or another did not resort to any treatment\textsuperscript{284}.

A close and critical scrutiny of medical and sanitary administration in Punjab during the period under review tends to suggest that the means of medical relief were not adequate in proportion to the wants of the people. The different trouble and diseases from which the people suffered every now and then and their unceasing hue and cry were a proof of the fact that the medical facilities provided by the government were neither sufficient nor satisfactory. The number of hospitals and dispensaries was less and this was particularly the case in the rural areas.

The reason for their small number can be found in the imperialistic motives of the British. They did not feel concerned about the sufferings of the people and as such provided meager sums for medical relief. In return for such relief measures, they expected little from the people very often perhaps no more

\textsuperscript{282. Ibid., p. 1.}
\textsuperscript{283. Ibid., pp. 15-19.}
\textsuperscript{284. Ibid., Punjab Legislative Council Debates, 9 March 1925, Vol. VIII, No.8, Lahore, 1925, p. 389.}
than thanks. Hospitals were situated miles apart from each other. There was one hardly to be found in an area of 25 miles 285.

Punjab, unfortunately, had the highest death rate in India as compared to other provinces. The province was frequently visited by epidemics such as malaria, plague, smallpox, cholera etc. Thousand of Punjabis, succumbed to these diseases. Sometimes ‘the people died like flies, whole families were wiped out by the dozen’. What did the government use to do? After these epidemics had wrought havoc for a number of weeks or months, it suddenly woke up to its sense of duty to the public 286. The officers and servants of the Public Health Department kept themselves at rest so long as there was no epidemic or disease raging. They did sit quietly and wait for the epidemic to rage, before they took steps to improve matters, when it had already got a strong grip and taken a heavy toll 287.

It is really a matter for great regret that in the district of Rohtak alone as many as 25,000 people were allowed to die of plague in one season (1915) 288. It was not plague alone that was prevalent in the Province; there was malaria, and there were various other diseases. A great proportion of this mortality was preventable if proper steps had been taken. So far as infant mortality in Punjab was concerned, it was 260 per 1,000 live births. That was shocking 25% of infants less than one year of age were allowed to die every year 289. Such was the state of affairs regarding public health under the British. It had been recognised by medical science by that time that most of these diseases could be

285. Infectious diseases Hospital existed only in nine towns of the province even as late as in the forties of the 20th century. These hospitals failed in fulfilling the purpose for which they were meant. Their importance in the control of communicable disease in the Province was practically negligible. Report on the Public Health Administration of the Punjab for the Year 1940, (Lahore, 1942), p. 36.
289. Ibid.
'While we spend large sums in trying to cure diseases', wrote Lord Riddell, 'we are sadly behind in taking steps to prevent them'.

There is no denying the fact that the government could avoid all that misery by adopting preventive measures, for a penny spent in time could save a pound wasted afterwards. The government did not seriously and earnestly try to tackle this problem and allowed such disease to work havoc, which might have been prevented by proper sanitation and by adopting proper preventive methods at the proper time.

The British acted on the assumption that the Indians had unsanitary habits, which required constant surveillance and isolation. Consequently, the administrators laid stress on cordonning, quadratics and disinfections of the dwellings and personal belongings of the sick. The afflicted were segregated in tents and huts till they recovered or expired. Disinfections and fumigation of their dwelling and household articles was carried out to prevent the spread of the disease.

Vaccination was another measure adopted by British government to combat diseases. The success of the system of selling quinine through the post-office in Bengal led to its introduction into the Punjab in late 1894. However, the people in the beginning were indifferent to the advantage of quinine as a prophylactic. Measures for the destruction of mosquitoes and mosquito-breeding places were undertaken. The detailed investigation to control malaria carried out in 1901 at Mian Mir Cantonment, laid emphasis on destroying the mosquito-breeding places. The destruction of malaria-carrying mosquitoes was started in 1908. For this, collections of water were either drained or filled up,

292. Imperial Gazetteer of India, Punjab, p. 147.
irrigation channels were cut, swamps were oiled and grass and undergrowth were cleared\textsuperscript{293}. In order to control cholera, improvements in water supply were made. The wells were disinfected with lime or alum\textsuperscript{294}. Bathing on the platform of the wells was prohibited\textsuperscript{295}. Chlorination of water was started in 1937\textsuperscript{296}.

But the measures adopted by the British to combat epidemics restricted the movements of people, controlled the disposal of their dead and interfered with their social customs and religious practices. Physical dislocation and economic hardships, especially of the poorer section, were integral to this situation. The responses of the people to eradication measures, however, depended on the ways in which the measure affected particular sections of the society. Their reactions also varied over time and in response to the changing socio-political climate in the region. The measures like vaccination and inoculation evoked the maximum reaction. The social leaders raised objections on grounds of religion and customs. Priestly class and the practitioners of indigenous medicine like \textit{Vaids} and \textit{Hakims} passed resolutions against the western system of medicine, and encouraged resistance.

On the other hand, the professional middle class comprising lawyers, doctors, teachers and journalists came forward to educate the general public regarding the benefits of various eradication measures. They also felt that in order to stamp out epidemics certain basic measures of sanitation and public health were necessary. \textit{The Tribune} called upon the educated to give the necessary advice to their ignorant brethren and to remove their misunderstandings regarding the plague preventive measures\textsuperscript{297}. During the malaria epidemic in 1908, an appeal was made in the \textit{Khalsa Advocate} to Lt. Governor for organising relief measures\textsuperscript{298}.

\textsuperscript{293} Proceedings, Home: Medical and Sanitary, October 1908, Sr. No. 72, p. 80.
\textsuperscript{294} Ibid., July 1896 Sr. No. 41, p. 120.
\textsuperscript{295} Proceedings, Home, June 1876, Sr. No. , 8, p. 335.
\textsuperscript{296} Proceedings, B Home: Public Health, 1938, Sr. No. 195, pp. 8-10.
\textsuperscript{297} \textit{The Tribune}, 28 April ,1907, p. 3.
\textsuperscript{298} \textit{Khalsa Advocate}, 7 November, 1908.
The measures to prevent epidemics were viewed by masses as violating their religious susceptibilities, domestic privacy and family honour. Their fears found expression in different ways. The people were quick to give credence to rumours, which revolved around vaccinations and plague eradication measures, both of which were carried out with force. Regarding vaccination, it was believed that the government was marking the children because it was looking for people fit enough to be slaves. Another rumour that found easy acceptance was that the British wanted to cut short the growth of the nation by injuring the nerves of virility and making the children impotent. Some thought that by vaccinating people, the government was collecting a certain quantity of human blood for propitiating a deity. Vaccination was also seen as a means of spreading Christianity.

People, began to hide themselves from officers as there developed utmost dislike for arm to arm vaccination. In Lahore city, the children afflicted with smallpox were hidden when the vesicles were ripe and they were required to be brought out for inspection. In Rohtak district, villagers gave presents to the vaccinators for allowing the children to remain unvaccinated. The resistance to the eradication measures came from those people who were directly hit by these. In Amritsar, during the cholera epidemic in 1875, a native practitioner of traditional medicine incited the Kashmiris not to get themselves inspected. His private practice got affected by the medicines administered by administration.

299. Ibid., February 1881, Sr. No. 13, p. 84.
300. The insensitive handling of women made matters worse for them as no consideration was shown for their privacy, personal dignity and social customs like purdah. The male vaccinators dragged women out of their homes and forcibly vaccinated them on the village ground. Their medical inspection was carried out by the male medical officer in the presence of all, which caused general resentment.
302. Ibid., February 1881, Sr. No. 13, p. 84.
303. Ibid., December. 1879, Sr. No. 11, pp. 6-7.
304. Ibid., July 1884, Sr. No. 18, p. 92.
305. Proceedings, Home, April 1874, Sr.No.6, p.185.
306. Ibid., June 1876, Sr. No. 8, p. 337.
Though some improvements were effected in the sanitary conditions of the towns, yet there remained much to be done. Actually, the things were equally bad in some of the cities as in the rural areas. Many municipalities did not seriously consider the questions of public health and drainage. They did not show a greater sense of duty with regard to these and did not discharge their duties satisfactorily in these directions. The progress of rural sanitation, which involved health of the great bulk of the population, was slow. No doubt, the Punjabis, by and large, had not been sanitary minded till the end of British rule. But at the same time the efforts made by the government and its other agencies were sporadic and half-hearted. The efforts to create awareness regarding personal hygiene and sanitation among public were conspicuous by their absence. Rural habitations were worst hit by lack of sanitation and contamination of drinking water.

Mohinder Singh, Member Punjab Legislative Council, commented very aptly that although Public Health Department was very necessary yet it was of no use because officers of this Department cared very little to help the people living in the rural areas. On the other hand, it had been a useless burden on the revenues of the province. It is true that the efforts of governmental agencies to provide physical facilities for sanitation were not fully rewarded because of lukewarm attitude of public at large to their non-participation in maintaining their immediate physical environment pollution free. But the medical authorities instead of taking a personal interest in their job, often used to remark that let the numbers of Punjabis decrease by the unsanitary conditions created by them in

309. See Victoria Paper (Sialkot), October, 1890; Report of Native News Paper Punjab, 1890, p. 376.
their dwellings, they would come to understand the importance of health. This type of attitude on the part of the government and medical officers shows how seriously and sincerely they took the problem of rural sanitation.

Besides, vaccination campaign was not carried out effectively. The work of the vaccinators was not checked or supervised efficiently by the medical authorities. Effective steps were not taken for creating awareness especially among rural population regarding the importance of vaccination in checking the spread of epidemic.

Although there were many drawbacks and shortcomings in the medical relief provided by the British, yet it is a fact that modern scientific treatment of all diseases was started for the first time by them in this province. The British introduced the Western System of medicine when both the Ayurvedic and Unani systems of medicine were in a static condition. There were only a few learned vaidyas, who, in spite of adverse circumstances, were keeping the tiny flame of learning alive. To lessen the morbidity in the province and for the care and treatment of the suffering and ailing people, they established many hospitals, dispensaries and asylums. Efforts, though limited, were made to educated people regarding personal hygiene and environmental cleanliness.

The total extermination of epidemic and health problems in the province was a matter of persistent and organised effort on the part of administrators. The ideal of community health could not be achieved through a container of medicine or a surgical operation. Only a vivid realisation of the grievous condition of the people could infuse in the British a sense of doing something to redress the sufferings of the people. But such a realisation was only a will-o-the-wisp of the people under the colonial rule.

Printing Technology is another important technological project introduced by British. There were many factors that obliged British to produce print technology. It is well known that by using military force, British established control over the whole of India and Indian people. Now, in order to conquer the mind of Indian people and to colonise their consciousness, British resorted to print technology for the strengthening their power in India, demolition of Indian's pride and belief in their own systems of knowledge, religious and cultural values became necessary and projection of the superior western culture, religion, sciences and arts was considered to colonise the mind of Indian people\textsuperscript{314}.

The availability of paper or newsprint, printing machines and movable types in English and languages printing had broadened the impact of writing a thousand fold, brought knowledge out of closed communities and castes into the hands of activists spreading and intensifying the freedom, reminisce, and reformation movement, industrialisation and revolution\textsuperscript{315}.

When print technology was introduced, the Bengalis, south Indian, Maratha, Hindustanis and Punjabis attempted to use printing press because they sought in general to learn and master the British ways\textsuperscript{316}. Indian students in western-styled schools and colleges, orphans in orphanages and employees in government offices, combaters for jobs in institutions used printing or worked as printers, managers and technicians\textsuperscript{317}.

During the British rule, after being educated in western school, a number of educated Punjabis had begun to show an interest in local, regional, national and international affairs. This generated hunger for news\textsuperscript{318}. And Punjabis adopted the printing technology to their needs. The mechanical invention, which


\textsuperscript{316} Kamlesh Mohan, 'Technology and Religion', p.263.

\textsuperscript{317} Ibid., p.263.

\textsuperscript{318} Shyamla Bhatia, \textit{Social Change and Politics in Punjab}, p.17.
facilitated the growth of newspaper industry and, the distribution system of news. The mechanically invented press now began to be used as an effective medium of mass communication and also it proved to be more useful to protect India's cultural identity and their religious beliefs which had been attacked by the colonial administrations and Christian missionaries\(^{319}\).

This need was at first fulfilled by the newspapers which played an important role in social and political mobilisation. The hitherto localised news was now published in papers and read by men in remote corners. The exponent of government news was the Civil and Military Gazette, while the liberal views of the people were represented by the Tribune, the Punjabi and the Zamindar; they were the chief instruments in arousing the people against the government's unjust acts, and the behaviour of Europeans towards Indians, which resulted in protest meetings all over Punjab\(^{320}\).

The press had begun to shoulder the responsibility of educating its readers. By 1901, several newspapers had begun advising people to get themselves inoculated against plague. Some papers also appealed to the people to desist from believing the rumours like the one that doctors were poisoning the wells\(^{321}\) the vernacular papers also supported the idea of establishing an institute for furthering technical education in the province\(^{322}\).

Indian Press matured rapidly Lord Hamilton, the Secretary of the State, expressed the hope that some day the press in India may become a source of help to the government, but at present it is worthless, except so far as to occasionally indicate the trend of opinion of that very limited portion of that community who have passed through a system of English Education\(^{323}\).

\(^{320}\) Shyamla Bhatia, Social Change and Politics in Punjab, p. 65.
\(^{321}\) Gazetteer of India, Home Public, August 1902,Nos.436-437.(confidential).
\(^{322}\) Ibid.
\(^{323}\) Morley Speech on Indian Politics in 1908, Morley Collection, 573/63.
Apart from introducing new technology in the major departments of inland and overland transport, communication and agriculture, the British also brought a few more mechanical devices, viz., brick-making machines, air-cooling fans, the bullock-punkha, the American cooking stove and other articles of general utility. Some other European articles such as watches of sliver or yellow metal, spectacles, small mirrors in plain frames and the folding umbrella were also introduced by the British. This is the sum total of the introduction of new technologies during the British rule. Apparently, most of the machinery brought into India during this period was meant for the consolidation of the British authority in India. It also aimed at developing the local resources, not manufactures, to enable certain staple exports of Punjab to maintain their ground in the markets of Europe. Thus, instead of leading India to the gateway of industrialisation, the British turned it into a major source of raw materials. Steam engine, telephone and railways were indeed great innovations, but they proved useless or even harmful in the absence of manufacturing machinery. Besides, all that the British attempted in the field of technology was a blatant practice of importing technology. The required machinery was imported from Europe or America and planted in India by a stock of ‘imported engineers’, the British did not care to prepare the infrastructure for a technological breakthrough. Indian artisans were deliberately kept away from the mainstream of the educational system. A few centres opened for their training aimed at preparing a class of attendants to European engineers. The discoveries of modern science were seldom brought to bear upon the familiar arts of India. The work of medical officers increased due to various military operations of the British government, Indians were given training in medical science to assist Europeans doctors. These humble assistants were known as ‘native doctors’. For the British, large-scale construction schemes and engineering works such as the railways, telephone and irrigation canals were

325. The Hindu Patriot, January 1, 1857.
326. Anil Kumar, Medicine and the Raj, p.18.
monuments to their supremacy and kindness. In stone, steel, and steam they embodied the idea of the British Raj as a technological empire, able by its grand works and feats of engineering to master forces of nature that had defied enslaved Indians for centuries. It also seemed that British stimulated agriculture, industry and promoted other works of public utility and improvement in the hope that India's contentment would be the best guarantee of British security.

British scientific activities in Punjab and introduction of some type of new technologies though aimed at the fulfillment of colonial interests evoked great amount of interest among the local people. Theoretically, colonial science did not offer much to the Punjabis. But its introduction through the agency of medical science, a new education system, and technological innovations had direct bearing upon the socio-religious reformers of the Punjab, who began to consider the educational and other activities of British and its Christian missionaries were a great threat to their survival in their own country. Their response was on rational grounds. To propagate their own religious views, they appreciated and used some western innovations, adopted a few and rejected those which did not suit their requirements and religious conditions.

In the next chapter, responses of various religious reformers are discussed.