Chapter 5

FROM EMBANKMENTS TO DAMS AND BACK TO EMBANKMENTS

In the previous chapter we have seen that the colonial government had recognized the problems generated by the embankments and the need to regulate and control the construction of new, or strengthening and extension of old, embankments. It is also clear that only a few embankments were taken over and maintained by the Government in North Bihar. Legal provision had also come into place to help the government officers deal with the flood and drainage problems in a comprehensive manner. But, as we will see in this chapter, the rivers were yet to be under the control of the colonial rulers. The flood situation, instead of improving, further deteriorated. From 1875 onwards, and especially after the famine of 1896-97, Railway and road network in the region increased. The zamindars and others kept on constructing and strengthening embankments on their own with competitive zeal with the Government often unable to tackle them.

However, there were some positive developments too. The important change was the attempt to look at floods from a wider perspective. Co-ordination between different districts and between Provincial governments increased. The logic was that local action at some place affected other stretches of the river. Thus, a comprehensive flood policy for each river basin was gradually developed where the interests of each village, pargana, district and province was to be taken into account before taking any action.

But all this wisdom came a bit too late. Metaphorically speaking, the water had already gone over the ‘red mark’. A lot of permanent damage had already been done to the complex drainage network of the region. Vested interests had developed in the areas protected by the embankments, which did not allow the introduction of any positive and
drastic change. We also see a change in general perception. There was a complete unanimity in the rejection of embankments as a means to control floods. Dams, as a technology option was gaining acceptance. But that is, as we shall see, not the end of the story, there were further twists and turns in this tale of rivers. There was a re-entry of embankments as a viable technology option to control the rivers.

I. Railways, Roads and Floods

In the last quarter of the 19th century, there was a large-scale construction of railways and roads in this region. It was precisely in this period that the Irrigation Department was trying to control and regularise the construction of any new embankments, and repairs of old ones, which were the worst offenders in obstructing the drainage of the country.

In North Bihar, "Railways and roads with inadequate waterways could be considered as bandhs". The way they were built, without a proper survey of the region through which they crossed, and not taking into account the local opinion, created a lot of problems for the already grave flood situation. As we will see in this section, they were often the worst offenders in obstructing the drainage of the country.

The alignment of most of these railways and roads (generally in an east-west direction) was across the drainage of the country. (See Map No. 7) The obstruction to the "free flow off of floods and spill along the natural drainage line", even if provided with adequate waterways, could not "fail to aggravate the annual floods, and is therefore likely to do more harm than good". This impounding of water necessarily ensued serious damage to health, agriculture and property.

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1 Ghosh, p. ii.
2 "Extract from the proceedings of the District Board Meeting held on the 6th April 1896", Selections from the Records of the Bengal Government, Railway Department; Papers from 1896 to 1905 Regarding Insufficient Waterways on the Tirhoot State Railway, Calcutta, (date not mentioned), [Selections (Railways)], p. 1.
3 Superintending Engineer, Northern Circle to Chief Engineer, dated 19th April 1897, Ibid., p. 11.
The most important reason why the railways and roads made floods a menace was the inadequate and insufficient waterways provided in them to allow the escape of floodwater. The legitimate demand of the *ryots* and planters for providing more waterways was stonewalled by insensitive Railway engineers for whom following the regimented rules of the technical manuals was more important than to protect the interests of the local people. The Railways constantly stressed that from a purely engineering point of view, and for the safety of the line, it was best to concentrate the discharge of the whole area into as few channels as practicable. The idea was to "avoid minor openings which in floods might at any time assist a bias on the part of the river to change its course, and by being enlarged might do very great injury to the line".\(^5\) Thus the interests of the engineers designing the necessary works and the civil officers of the Local Government who were under pressure to guard the rights of the landlords and *ryots* occupying lands in the affected area were not identical. The result was often a long debate between the two over the role of the railways in aggravating the flood problem and how best to minimise the damage on the proposed Railway line.

By looking at this matter in a purely technical manner, the due considerations of the rights of the owners of the property situated on the upper side of the line of embankment and also in its vicinity, in which for long lengths there were no waterways, were overlooked.\(^6\) By cutting off the flood spill from the direction of their natural flow, the Railways and District Boards in their own pecuniary and technical interest brought in a complete change in the condition of their lands. The results were detrimental to property, agricultural interests and sanitation.

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For example, the villages Chotaipatti, Chhatwan, Gokhul, Loma, Belhi, etc. situated on the right bank of the river Jiwachh in thana Darbhanga, were very badly affected by excessive flooding because of the existence of Tarsarai-Rayam embanked trolley line with insufficient waterways. The existing waterways were very small and practically choked up.\(^7\)

The District Boards were no less responsible for damming up of the river spill. For example, the District Board road No. 11 below Angarghat in Darbhanga district was highly embanked and not provided with any waterway although there were two big bridges in the railway line opposite to this portion of the road. The embanked portion of the road, called the Dakaha *baha bandh*, obstructed a lot of flood spill of the Burhi Gandak which had a tendency to flow towards the west. Flood congestion in the area above the junction with the Bagmati and the Burhi Gandak could have been "greatly relieved by providing a sluiced culvert of suitable size provided with shutters...."\(^8\)

In fact, there were instances where the Railways had to pay compensation to those *ryots* whose lands were damaged by Railway embankments. Compensation had to be paid by the Bengal and North-Western Railway Company to some peasants of the Saran district for damage to the crops caused by the construction of an embankment across the Banwari Chuck valley in 1886, which had resulted in loss for growing crops drowned by blocked inundation.\(^9\) The compensation was originally estimated as Rs. 60,000, but later compromised at Rs. 10,000 for distribution to the *ryots* concerned. By the large size of the compensation, one can surmise the extent of the damage.

\(^7\) Ghosh, p. 87.  
\(^8\) Ibid., p. 81.  
In most cases, however, the Railways denied the role of embankments in damage caused to lands from floods by contending that the railway embankment obstructed the spill on both sides, thus, not making any overall difference to the flood situation of the area. In response to a council question asked by Babu Lachmi Prasad Sinha at the Meeting of the Bihar and Orissa legislative Council on the 28th November, 1915, regarding the obstruction of the overflow of water from the left bank of the Gandak river into the Bagmati river by the construction of the Khagaria Rosera line of the Bengal and North-Western Railway, the Railways contended that the floods could not be attributed to the railway embankments. The Agent of the B&NW Railway argued:

The Khagaria-Rosera line runs about midway between the Bur-Gandak (sic) River and the various old beds of the Bagmatti (sic) river and therefore if the railway be said to obstruct the overflow of the Bur-Gandak it equally obstructs the overflow from the old Bagmatti. The District Board Road, however, runs between the Bur-Gandak and the railway and it is only when the Bur-Gandak spill tops this road or when the road is breached that any considerable body of water can reach the railway.

What the Railways did not mention was whether the headings up of the spill waters of Burhi-Gandak by the railway embankment was causing higher floods, than what was earlier caused by the spill of the old Bagmati and Burhi-Gandak together. Also, it was only in few occasions that both the Burhi-Gandak and Bagmati were together in floods. So when one river spilled its banks its water was drained into the other, and *vice versa*, thus providing an unobstructed passage to the floodwater. The Railway embankment and the District Board road obstructed this free flow of the river spill leading to higher floods in the region. Thus to reiterate our argument that it is not that colonial intervention led to floods, floods were an

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10 File No. XIII-C/8 of January 1915, PWD(I), Bihar and Orissa.

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integral part of the agro-ecology of the region. The British had changed the very nature of the floods making it gravely damaging to property and human life.

In another case, while denying the concerns of some people about the possibility of greater floods which would have occurred by the proposed railway embankment in Khagaria-Katihar line, the Agent of the B & N W Railway argued on similar lines.\(^{12}\) (See also Map No.7)

In high floods, the whole country between the Kosi and the Karagola road is under water, which is dammed back by the floods of the Ganges and the railway bank can cause no greater amount of afflux. On the contrary, the railway bank by shutting out the Ganges floods is likely to tend to reduce the flood level of the country north of the railway.

The Purnea District Engineer who had more than twenty years of experience of the district had a better understanding of the situation. He believed that "the Railway bank will more than take the place of Ganges inundation, as it must raise the Kosi spill flood level much higher...."\(^{13}\)

The flood problem also became acute in lands lying between the road and the railway banks, where, once the water entered, it remained hedged in and thus delayed the subsiding of floods. While describing the floods in Monghyr district in August 1904, the Collector of the district maintained that the tract that had suffered the most was that between the B&NW Railway line and the Tirhut road, "the water having topped and breached the road in its progress northwards, being stopped by the railway embankment, turned eastwards, and between the road and the railway, which are not far apart, a considerable

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\(^{12}\) Agent and Chief Engineer, Bengal and North-Western Railway to The Consulting Engineer to the Government of India for Railways, dated 3\(^{rd}\) September 1897, Selections (Railways), p. 24.

\(^{13}\) Ibid., p. 2 (emphasis mine).

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It was obvious that the railway embankment was responsible for the floods; "it rendered absolute the partial evil caused by the road". The reason for higher floods was because of existence of no waterways in both the bunds.

The Railways and District Boards, both tried to skirt the responsibility of constructing bridges and culverts, first, because of the huge expenses involved, and second, due to safety factors. In fact, there were cases where existing bridges on roads and railways, were filled up to safeguard them against breaching and scouring.

The Tirhut road, for example, when constructed, was provided with bridges to pass the water carried by the various spill channels of the Ganges which it crossed. The waterways provided were, however, insufficient, and "the excessive scour which occurred through the bridges endangered their safety, and consequently the Government in 1888 sanctioned the blocking up of all the bridges". Since then the road formed an obstruction, right across the line of the direction of the spill.

It is rather ironical that most of these railways and roads, which often led to flooding and destruction of crops and arable land, were constructed on the recommendation of the successive famine commissions as measures to protect the areas, through which they passed, from food shortages and famine. The Famine Commission of 1880 believed that "... it is to the future of the extension of railways that we look as the most complete justification of our belief that the trade of the country may be confidently left to provide for the supply of food in times of scarcity."  

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15 Superintending Engineer, South-Western Circle to the Chief Engineer, Bengal, dated 25th November 1904, *Ibid.*, p. 64.  
Another practice of the Railway authorities of safeguarding the existing waterways by temporarily closing them during the flood season caused great harm to the surrounding lands. The height of the embankment of the Tirhut Railway at mile 94111 between Salauna and Hassanpur Road on the Khagaria Samastipur chord (see Map No.7) line was about 11 feet from ground level. The root of the whole problem was the practice of blocking with sleepers the culvert having two openings of 4 feet and 6 inches each. The Railway authorities used this practice as a preventive measure to safeguard the culvert with its masonry and the line passing over it from a sudden rush of water. The villagers of Rampur had petitioned to the Sub-divisional Officer (SDO) about the distress they were facing as the water was piling up against the railway line while the railway authorities were not opening the culvert. When a Local board Sub-overseer was sent to investigate on 19 August, the railway people removed three sleepers from each span but thirteen sleepers were retained in each span, ostensibly for safety reasons. The result was that water continued to rise in Rampur owing to there being no escape. The SDO wrote that “had the danger from floods continued I should seriously have contemplated cutting the line myself after giving due notice.”

The differences in opinion between the two departments of the government became obvious when the SDO added that the “railway authorities have no right to go on appealing every year to the district authorities to protect them on the score that the cutting of the bank may cause a stoppage of the traffic or even a railway disaster, just because they are too niggardly to provide proper waterway. The Bengal and North-Western Railway are notorious in this respect.” On the early morning of 30 August 1918, the villagers of Rampur had to cut the embankment themselves.

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18 Commissioner, Bhagalpur to Chief Secretary, B&O, dated 20-9-18, VIIE-1/1919, A progs., PWD(l),B&O, p.3
19 ibid., p.4, (emphasis mine)
Similarly, the Begusarai subdivision was affected by a lack of waterway between Hassanpur and Salauna where in a stretch of 4 miles there was no waterway. The result was that the villagers made repeated attempts to cut the line. In 1914 they had cut the line at a spot not far from the 1918 cut, and in 1916 there was again a danger of the line being cut and armed police was deputed to prevent it.²⁰

The question of the blocking of the culvert (on the Khagaria-Samastipur chord line) assumed greater importance than before owing to the events that took place higher up. There was a bandh in Darbhanga district called the Panwa, which extended for about 20 miles along the east bank of the Bagmati and which prevented any of the flood water from escaping to the east and drove it all into the Gandak just above Rosera. The effect of this was that practically the whole of Warisnagar thana was seriously damaged by floods every two years out of three, and the Drainage Committee had recommended that the breaches in this bandh should be left open in order to escape to the east. The Bagmati waters spilling through these breaches was, dammed up further down owing to the blocking of the culvert with sleepers.²¹

The Commissioner of Bhagalpur complained that²²:

...there was no valid reason why the railway should not build its culvert strong enough to take any flow of water that is likely to be met with. If it does not do so, it has no right to save itself at the expense of the population of the surrounding country....This Company (B&NWR) has also a marked tendency to substitute sluiced culverts for ordinary culverts...which are useless when most required, as the sluices have to be kept closed at time of high flood.

²⁰ Ibid, pp.2-3.
²² Ibid.
1.1. Railways and Gogra Floods

Let us now study some of the more specific instances of railway and floods in some detail. The role of the Ballia-Chapra Railway line in aggravating the floods in the Gogra valley in the Saran district was a subject of a long and heated debate between the Railway and Civil authorities in Saran on the one hand, and between the officials of Bihar and United Provinces (U.P.), on the other in the 1930's. (See Map No.8) The main debate would be discussed in another section. For the moment let us critically examine the role of the Railways in aggravating the flood situation in the Gogra valley.

A note by C.G. Palmer, Superintending Engineer, PWD, U.P., dated 16 November, 1898 on the floods of Gogra in the Ballia district had predicted the future behaviour of the Gogra, which was amply borne out by the course of the flood of August 1938. Palmer had clearly established the fact that the shifting of the Ganges-Gogra junction 23 miles eastwards, from 1839 to 1895, was the effect of the rise of flood surface opposite the site of the 1839 junction. This was due to the individual regime of the two rivers concerned as far as it could be ascertained then.23 (See Map No.8)

At the time of Rennel's survey in 1779 the Gogra used to meet the Ganges at Manjhi but a diara formed in the confluence and shifted the junction eastwards. With the gradual shifting of the confluence certain spill channels were formed in the upper reaches of the right bank of the Gogra which relieved it of most of its discharge before it finally discharged into the Ganges. The Kol nala was the principal one among these spill channels, which crossed the Chapra-Ballia z to a maximum of R.L.187 at the Kol nala culvert recording station.

What is striking here is the complete opposition by the U.P. and Railway representatives in the Inter-Provincial Flood Conference at Lucknow in January 1939 to the Government of Bihar's recommendation of constructing an embankment along the left bank of the Gogra in Bihar. The U.P. representatives opposed the proposal because an embankment on the Gogra in Bihar, they felt, would have worsened the flood situation in Ballia and Azamgarh districts in U.P., while the Railways opposed it to safeguard the railway embankment and the Inchcape Bridge from getting breached. Even the recommendation that adequate openings should be provided in the Ballia-Chapra railway embankment including extension of the waterways of the Inchcape Bridge, for the escape of spill water into the Ganges on the U.P side of the Gogra was opposed by the Railway representative. The Chief Engineer of B&NW Railway maintained that the same were unnecessary and would result in high cost to railways in construction and maintenance. It was considered that the railway embankment did perhaps as much good as harm, especially in the prevention of the Ganges flood in the Ballia district and that an embankment without openings was perhaps necessary for the proper training of the river Gogra through the Inchcape Bridge. Bihar Government's concerns on the grave effect of the railway embankment on Saran, on the other hand, were completely ignored.24

1.2. Roads and Floods

After the earthquake of 1934 in North Bihar the Government of India's policy became that all roads under Local Bodies' were to be restored to their pre-earthquake condition. In specific terms, the policy adopted in the Tirhut Division was to raise all main roads by 2 feet and all minor roads by 1 foot above the 1935 level.

24 VIIIID-5/1939, C progs., PWD(l), GoB, p.K.W.
The 1935 floods were taken as a criterion because of the unprecedented nature of the flood and damage it caused to the roads. The flood was due to abnormal rainfall on an already saturated countryside following the peak point of the flood. In normal times such a flood was expected to disperse without seriously damaging the main roads; it would have overtopped and damaged a considerable number of minor roads. In 1934 the floods were far below normal level and the silting and contraction, which choked the river-beds after the earthquake, were not completely eased. Consequently the 1935 flood assumed abnormal proportions, the rivers not having re-established their regime (or their original course). Captain G.F. Hall, the Chief Engineer, believed that "it was erroneous to consider 1935 flood as the criterion for raising the level of the roads. A better policy could have been to wait for 2-3 years for the restoration of the river regime." 25

The District Engineer, on the other hand, argued that all the roads had sunk, the majority were never overtopped before 1935 and that their raising would only restore them to their pre-earthquake condition 26:

That some embanked roads have subsided is beyond doubt, but so has the country in general, and the relative condition of road crests to country levels is little changed on the whole....To raise all the roads above the 1935 level is not only raising them far above their pre-earthquake level but raising them to a level which will have disastrous result on the flooding of the country. The raising of roads can only be justified if additional waterways are provided...which would be prohibitively expensive.

Captain Hall contended that during high floods these high roads would be dangerous to use and the crest of the road would be so high above the country that it would absorb no moisture and crumble quickly. He also cautioned that in the state of doubt after the

25 Note by the Chief Engineer, dated 28th February 1936, IXW-4/1936, B progs., PWD(l), GoB,p.2.
26 Ibid., p.3.
earthquake for want of reliable data it would have been better to err on the side of lower than higher roads.27

The real reason behind the feverish desire to raise roads was that the District Boards hoped to get all work done from the funds of Government of India for earthquake relief. In the search for such petty gains, the interest of authorities in charge of communications seemed to be diametrically opposed to those whose job was to try and devise means to mitigate flood damage.28

1.3. Railways and Malaria

The role of Railways in disrupting and destroying the drainage network of the area through which it passed has been well documented. That this helped in the breeding of the malaria-bearing mosquito is also hinted. But how it actually aggravated the outbreak of malaria is something that remains to be discussed.

W.W. Clemesha, Sanitary Commissioner of Bombay, in his note on the role of railway construction on malaria in India, laid special emphasis on the necessity on the control of a large number of construction labour that were brought together for the purpose of railway construction. In his opinion, outbreaks of malaria and the general unhealthiness of large tracts of country were due to the deficient sanitary arrangements made during the aggregation of labour at the construction site and the unsatisfactory conditions under which these labourers were housed and controlled. According to him the most modern research on malaria corroborated the fact that the deciding factor in the Burdwan fever epidemic was the aggregation of labour and the expansion of trade caused by the opening of the railway line from Calcutta to Burdwan. According to him, the advent of 8 to 10 thousand coolies from all

27 Ibid., pp.5-6.
28 Ibid., p.6.
parts of India, bringing with them a fair percentage of malaria parasite bearers, was just the
one factor necessary to start a violent epidemic, as it also did in Bombay in 1908.29

He was also of the opinion that the results of borrow pits30 and the blocking of
drainage on the health of the local inhabitants had been exaggerated. But he admitted that in
some areas borrow pits were undoubtedly the cause of malaria and that in certain cases
railway lines had caused serious obstruction. According to him in the neighbourhood of
towns and railway stations, or other densely populated areas, borrow pits created problems.
It had been suggested that in some provinces railway companies should be encouraged to
dig deep tanks instead of borrow pits in inhabited areas. Clemesha also quoted Major Fry’s
first report on Malaria in Bengal where the latter believed that in some areas deep tanks and
borrow pits which contained sufficient water all the year round to enable fish population to
survive and which were free from weeds were rarely important as breeding places for
mosquitoes.31 Clemesha further admitted that a large proportion of instances he cited in his
note were from Bengal because it was a malarious country and, therefore, more liable to
serious accidents of this nature.32 So for Clemesha, while borrow pits and the blocking of
drainage by the railway embankments were significant causes for malaria, the deciding
factor necessary for a violent epidemic was the aggregation of large number of labourers at
the construction site.

The officiating Secretary, Irrigation Department, Government of India agreed that
the water-logging in certain areas was due to the interruptions of the natural flow of water
by embankments and canals which were insufficiently provided with waterways and by such

29 W.W.Clemesha, “Note on the influence of railway construction on malaria”, Dated 27-9-1916, IVM-14/
1919, B progs., PWD(l), B&O, p.2. [Clemesha]
30 For the construction of the railway embankment soil was dug up from the nearby land which were acquired
by the Railways. So on both sides of the railway embankment pits were created, and these were called borrow-
pits. Stagnant water in these borrow-pits provided an ideal condition for the breeding of malaria.
31 Clemesha, p.2.
32 Ibid., p.4.
water-logging both the health of the people and, in certain large tracts of country, the productivity of the soil was prejudicially affected. He felt that every attempt should be made to see that natural drainage was not impeded and that, where it was already impeded, such impediments should be removed.\(^{33}\)

From the above discussion, it is evident that the government had admitted that the Railways and Roads were responsible for worsening the flood situation in North Bihar. The alignment of most of the railway lines and roads was right across the drainage line of the country through which they passed. Also, the hesitation of the Railways to construct waterways on the embankments, on financial and technical considerations, to ease the drainage situation of the region showed their insensitivity towards the interests of the people of the region.

Improvement in the communication in North Bihar was considered to be a prerequisite for providing protection from famine. However, Railways and Roads were responsible for increased floods and drainage congestion in the region which consequently led to the destruction of crops and arable lands. So, while an opinion against embankments was building up within the bureaucracy and the engineering community, the construction of railways and roads continued. The Railways, it seems, were determined to go forward on their chosen course.

\(^{33}\) Ibid., p.3.
THE MAP SHOWING TILJUGA EMBANKMENTS AND AREA FLOODED 1913

Map No. 9

Source: File No. HE-5/1933, B prog., PWD(D), B&O.
2. Competitive construction of private embankments: Tiljuga Embankments

Despite the government's discouragement, private embankments were being constructed flouting all norms, rules and regulations. There was a growing competition among the zamindars for constructing embankments to safeguard their lands and crops from damage from inundations. Although an understanding about the inefficacy of trying to control the rivers was gaining ground among the bureaucrats and engineers, it was not shared by the zamindars. The process was contagious. Construction of an embankment in a stretch of the river by a zamindar was met with embankments in the rest of the stretch of the river by another zamindar, as the first embankment increased flood levels in the rest of the river stretch. These zamindars also wanted to reclaim the lands which were temporarily uncultivable. This also demonstrated how ineffective and inefficient the local administration was to meet these breaches of law. Moreover, even the District and Provincial Governments were a bit hesitant in dealing with the big and powerful zamindaries, like the Darbhanga Raj. In this section the much quoted example of Tiljuga embankments is discussed to show how the zamindars were equally responsible for presence of embankments in North Bihar. The Tiljuga embankments are prime examples of the mad rush of building embankments without bothering about its future consequences on other 'unprotected' lands.

2.1. The Tiljuga Embankments

The river Tiljuga formed the boundary between the districts of Darbhanga and Bhagalpur. The river Balan flowed mostly through the zamindari of Darbhanga and joined Tiljuga at a point between the village Rasriari in Darbhanga on the west and Bakunia in Bhagalpur on the east. Earlier there were no bandhs on the Tiljuga. The Darbhanga or western side of the river

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34 Embankments were erected by the Darbhanga Raj and Banaillly Raj on the west and east of the river Tiljuga respectively. In this study the embankments along the river Tiljuga would be collectively called the Tiljuga embankments unless otherwise mentioned as Darbhanga Raj or Banaillly Raj embankments.
was lower than the Bhagalpur or the eastern side of the river and the low-lying areas on the west consisted mainly of grassy swamps. It was to bring this area under cultivation that the Darbhanga Raj constructed marginal embankment on the very banks of the rivers Tiljuga and Balan in or about the year 1871 which were raised and strengthened from time to time, and in 1893-94 the Tiljuga embankment on the Darbhanga side was raised and strengthened and made into a continuous embankment built close to the banks to the river.\(^{35}\) (See Map No. 9)

Tiljuga was a river subject to violent and heavy floods. Before the existence of embankments on either bank, during the floods the river used to flow to a width of six miles, but the level of water on either side was low. The country on the west, i.e., the Darbhanga district, provided as good a spill for the floods as did that on the eastern side, i.e., the Bhagalpur district. In fact, the valley between the existing bandh on the west and the ridge from Rasiary to Jhagadua and Tetri on the south constituted the natural spill on the west for the Tiljuga and supplied the Haka (Hukka) Dhar. The Haka Dhar was a broad spill channel with proper banks and rows of trees, showing its antiquity and uses.\(^{36}\) (See Map No.9)

The river Tiljuga had excavated some large channels on the eastern side, which did not appear to have existed before the erection of the Tiljuga embankment or were of comparatively smaller size. On the east, the spill of the Tiljuga flowed over the low lying land of Partaha and Bakaunia on the one side, and Partaha and Rampur on the other. There was a nullah called Sati nullah, which earlier was not very deep and broad, but a deep channel had been excavated right down to Darhar (Darhor). South of Darhar, the country on the east was a vast expanse of low land subject to the Tiljuga flood. Another characteristic feature of the country was that there was a ridge coming from the north, nearly from Gobindpur to Rasulpur where there was an abrupt break, but the ridge appeared to be

\(^{36}\) B progs., PWD(l), GoB, September 1914, Vol. IV, p.4.
continued after the break from Birjain to Satour on the south. So except the ridges on which most of the villages on the east were situated, the whole country was immersed under floods, before the erection of the eastern embankment.\(^{37}\) (See Map No.9)

Before the construction of the western embankment good paddy crop used to be grown on the eastern side of the river but the erection of the Darbhanga embankment too close to the river had the effect of throwing the entire burden of the flood to the eastern side. So even in the years of ordinary floods the eastern area was severely inundated and crops even on comparatively high grounds were destroyed. This situation reached a crisis point in the floods of 1905 and 1906. Not only were the standing crops completely destroyed but villages were wrecked, stored grains was swept away and cattle got washed away.

The ryots of the flooded villages on the eastern side then approached the district authorities of Bhagalpur for protection. The idea of a protective work first struck Lyall, the then Collector of Bhagalpur who induced the managers of the Banailly and Srinagar Estates to agree to pay a sufficient sum of money for the erection of a substantial protective embankment to prevent that portion of their estate from being turned into a waste. He undertook to get the work done through the Bhagalpur District Board. He also informed the Government of Bengal in his letter dated 16 October 1906 regarding the acute distress prevailing in the district.\(^{38}\)

Due to the heavy floods of 1906, Darbhanga Raj had started repairing its bandh and in some places deviating it nearer the river bank. The Collector of Bhagalpur informed Darbhanga Raj about the construction of the embankment on the eastern side and requested him to construct the bandh on his side on a retired line so as to leave a waterway of half a mile. The latter did not accede to the request giving an evasive reply. It was then that the

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\(^{37}\) Ibid., p.4.
\(^{38}\) Ibid., pp. 2-3.
Collector, after taking sanction of the Embankment Committee and after informing the Government, issued orders for the construction of the Banailly-Srinager embankment approximately half a mile away from the middle stream. The work was completed in the course of four years (1907-10) at a cost of Rupees Two lakh supplied by the two estates. It extended for about 20 miles. (See Map No.9)

The Collector of Bhagalpur in his Famine Report of 1908-09 commented about the said bandhs: “There used to recur every year a more or less destructive flood which led to the gradual pauperization of a once prosperous community...These embankments have already been the cause of saving of the whole area affected...and are designed to protect some 70 square miles of country...A number of rayats had left the place for good leaving their homes and all. Many of them have already come back....”

Hammond who succeeded Lyall as the Collector of the district also took interest in the completion of the project. He reported that applications were beginning to come in for fresh settlement and Rs.2376/- which the villagers owed as taccavi loans had all been paid back. He also urged the Darbhanga Raj to build a similar bandh on the west with similar waterway, but to no effect.

But the government was getting worried about the effect of this spree in bandh construction on the over all flood situation in the area. In 1911, the Embankment Act was declared in the Darbhanga side, and the Darbhanga Raj was prevented from raising the height of its bandh (on the western side of Tiljuga). The same Act was put into force on the Bhagalpur side in 1912. The Government deputed Gubbay, the then Assistant Engineer, to make a thorough investigation in the matter. The latter suggested escapes (or sluice gates) on both the embankments to pass off the excess waters of the Tiljuga into the natural drainage

39 ibid., p.4.
40 Under the Embankment Act II (B.C.) of 1882, the government had the power to prevent the unauthorized construction of, or addition to, an embankment in a notified area.
channels or *Dhars*. Alternatively, his suggestion was to leave the Banailly *bandh* intact and construct the Darbhanga *bandh* at least half a mile away from the river (see the dotted straight line on the west of the river Tiljuga in Map No. 9). The Chief Engineer accepted the second proposal, but the Darbhanga *Raj* did not accept the proposal. K.K. Chatterjee another Assistant Engineer was deputed to make further enquiry and he also recommended the retirement of the Darbhanga *bandh* as the best solution, which was accepted by the Chief Engineer. The Darbhanga *Raj* did not accept any of the proposals of the Government and stuck to the non-retirement of its marginal *bandhs* and consequently Banailly *Raj* was prevented from doing anything on its side as suggested by the Chief Engineer.\footnote{B progs., PWD(I), GoB, September 1914, Vol. IV, pp.6-7.}

The erection of the eastern embankment had no doubt caused an enormous afflux to come into play, for though the Darbhanga embankment must originally have caused some afflux it was not brought prominently into play till the erection of Banailly embankment, and the two together restricted the waterway of the river. The Darbhanga embankment, by reason of its being in close proximity to the river, obstructed the direct current of the river during floods at all the turns and bends.\footnote{Report on the survey of the Tiljuga river by K.K. Chatterjee, Assistant Engineer, dated 18th April 1914, B progs., PWD(I), GoB, September 1914, Vol. IV, p.4.}

The effect of the alignment of the Darbhanga embankment and the restriction of the waterway during floods of the Tiljuga by the erection of the Banailly embankment was disastrous. There was not enough space between the two embankments to pass the extraordinary floods of the Tiljuga without breaching one of the *bandhs*. The flood of 1913 demonstrated this effectively. In 1913, as the flood had to pass between the two *bandhs*, the flood level rose high and eventually breached the Darbhanga embankment at several places.
The water of Tiljuga gushing out of these breaches flooded the lowlands. The damage had been considerable to the paddy crop as the latter got wholly washed off.

The Haka Dhar overflowed its bank and the surplus water damaged the young crops. There were signs of fairly good crop on high lands in that district, where the floodwater did not reach. Such high lands were found close to the banks of the Tiljuga itself. An area of 16 square miles in the district of Darbhanga was more or less affected by the flood of 1913. In the same way, water entering the Bhagalpur district through the breaches in the Banailly embankment affected an area of six square miles. 43

At this time the Darbhanga Raj was pressing for having the mouth of the Sati Dhar to be cut or opened by providing an escape on the Banailly embankment. Before the erection of the Banailly embankment, the Sati Dhar used to receive a heavy load of the Tiljuga. The Banailly embankment had cut off the supply of the Sati Dhar, thus putting pressure of the entire waters of the Tiljuga on the Darbhanga embankment. But the reopening of the Sati dhar would have had nearly the same effect as the abolition of the Banailly embankment altogether. All the low lands on either banks of the Sati "will be flooded again and the old state of things comes into existence once more."44

Having failed to gain his objective of getting the Banailly bandh demolished through the executive department, the Raja of Darbhanga turned to the Civil Court and got a suit instituted in 1916 through some of his tenants and afterwards he himself brought a suit in 1918 for damages and for opening the mouth of the Sati and for demolition of the embankment. Both the suits were tried together and after a protracted litigation for several years were dismissed by the District Judge of Darbhanga in the beginning of 1923. There

43 Ibid., p.5.
44 Ibid., p.9.
was an appeal to the High Court by the Raja and the appeal was also dismissed in 1928. Then there was Letter Patent Appeal, and at this stage the *Raja* entered into a compromise with the Banailly and Srinagar proprietors. A few points of difference were referred for arbitration to the Chief Engineer who gave an award in favour of the retirement of the Darbhanga *bandh*. The Darbhanga *Raj*, not satisfied with the award, ultimately withdrew the appeal altogether.\(^45\)

In December 1931, the Darbhanga *Raj* obtained sanction to repair the breaches of the Tiljuga *bandh* privately and under this cover illegally raised the height and breadth of the said *bandh* and also made some new *bandhs* inspite of protests from the Bhagalpur District authorities. The latter got lukewarm support from the Darbhanga District authorities and the Darbhanga *Raj* completed its *bandh* without taking notice of the Embankment Deputy Collector's order to stop the work till the disposal of the objections. To counteract the effect of the Darbhanga *bandh*, repairs were carried out on the Banailly-Srinagar *bandh* under the sanction of the collector of Bhagalpur.\(^46\)

During the 1938 floods a breach of 100 feet occurred on the Darbhanga *bandh* which gradually widened to a length of 435 feet. Darbhanga *Raj* authorities tried to close this breach but the Government prevented them. The flood-spill passing through this breach inundated about 20 square miles of area comprising of many villages of the Darbhanga district. The average spill depth in this area varied from 1 to 4 feet. The standing crops were, as a result, greatly damaged. This breach was, however, closed by the Darbhanga *Raj* before the floods of 1939 by an unauthorised ring *bandh* of 800 feet. During 1940 another breach of 935 feet length and 26 feet depth occurred in the Darbhanga embankment. The flood-spill

escaping through this breach further augmented inundation of villages in Darbhanga district. During the 1941 flood, two more breaches occurred out of which one was in the unauthorised ring bandh constructed in 1939 and for which there was Government order for demolition. This breach occurred in a length of 250 feet by the Kosi flood coming through the Tiljuga.47

The Banailly embankment also got breached at 7 places during the flood of 1938 between Bakaunia and Rampur for the total length of 2,530 feet and the flood-spill passed towards the south and fed the Sati dhār which lower down was called Gohi nādi. Between Bakaunia and Paranpur it breached at six places for a total length of about 515 feet. Just below Paranpur, half of the Tiljuga discharge passed into the Gohi through an old breach of 300 feet and the remaining half flowed down the Tiljuga and breached the embankment at 4 places in a total length of 340 feet. During the 1940 floods the Banailly Raj embankment almost wholly crumbled down due to yearly havoc wrought by the Kosi spills and no longer served as a barrier to the free flow of the flood-spills. The Darbhanga Raj embankment on the contrary was in fair condition and served as a great obstruction to the westerly diverted Kosi spill on account of which flood height on the east of this embankment increased with the result that the area was subjected to severe floods lasting for long periods.48

The Superintending Engineer, North Bihar Circle, warned in 1942 that the measure of the Darbhanga Raj were short sighted, which would deteriorate the flood situation even further in the future.49

47 Ghosh, op. cit., p.95.
48 Ibid.
49 Superintending Engineer, North Bihar Circle, to the Deputy Chief Engineer, Irrigation, dated 6th February 1942, Ibid., p.96.
...the Darbhanga Raj are adopting a very shortsighted policy, and atleast the junior officers of the local administration do not seem to appreciate the true situation... The Tiljuga river is now very definitely the Kosi and it is useless for the Raj or for the local administration to refuse to face the fact... Silt must be deposited over the Darbhanga district west of the Tiljuga bandh of the Kosi. If it is not and the Tiljuga embankment breaks, as it must in the future, people will be drowned not by tens or by hundreds, but by thousands... In the meantime, to prevent future great loss of life by drowning it appears necessary for the repairs to the embankment to be forbidden....

Thus we see a variety of vested interests involved in the building of embankments leading to disastrous floods in North Bihar. In the next section, an attempt would be made to clearly bring out the complex interests in play in the area. It would help us to understand another face of colonialism which often functioned indirectly. It is not often possible to identify the governments' direct involvement in any given situation at the local level. But the complex network of interests that colonialism brought about in the countryside played a crucial role in the events.

2.2. Politics of Flood Control

One problem with finding solutions to the embankments was that it took several years before the ill effects were manifested. Thus by the time the need was felt to make changes, "vested interests were created" which resisted any such change. A prime example of this was the case of the Gandak embankments, as discussed in Chapter 4.

European indigo planters, other indigo cultivators and zamindars, especially the first two, constructed embankments almost as a starting point to their project. This was because indigo was particularly prone to damage by excessive flooding of the land. For example, the Turki Embankment on the right bank of the Bagmati river in Muzaffarpur district was first

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50 Mazumdar, op. cit., p.18.
constructed in 1810 by the Manager of the Kanti Indigo Factory to safeguard the indigo cultivation of that concern and for more than half a century it continued to be maintained by the factory. In 1875, it was taken over by the Government under the Embankment Act under the Takavi system.

Similarly, a series of embankments along the Gogra and other large streams in Saran district were erected and maintained by the Manjhi Raja, who kept up these embankments at his own expense. But after the breaking up of this family, these embankments went into disrepair. In this case the government did not take it up and left it for the zamindars to look after it.

A similar case was the Gandak or Tirhut Embankment on the northern bank of the river Gandak. The flood of the Gandak first drew attention to the unprotected state of the southern portion of the Muzaffarpur district in 1801, when the East India Company's saltpetre factory at Singhia near Lalganj was nearly swept away. Accordingly, an embankment was constructed extending from the confluence of the river Baya to Harauli, six miles from Hajipur. From then on various repairs and changes in designs were made, and in 1874, "advantage was taken of famine relief operations to remodel, repair and raise it" and the embankment was extended up to Hajipur, a total length of fifty two miles.

Likewise, there were many more private embankments, which were indiscriminately constructed along the rivers throughout the 19th century. It was only from the last quarter of the 19th century that efforts were made by the government to regularise the construction of embankments, and take over some private ones to maintain them in proper state, through the

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51 Muzaffarpur DG, 1907, p. 69.
52 Inglis, p. 360.
passing of various Acts. The most prominent of these was section 76(b) of the Embankment Act II of 1882 through which the government tried to bring the private embankments within its control.

But these acts remained on paper and the Government did nothing to implement them. This becomes evident when the Superintendent Engineer himself admitted that “the Government notification of July 1891 extending section 76(b) to the tract along the Burhi-Gandak river had remained a dead letter from the outset and that in spite of the prohibition private embankments had continued year after year to grow up within the prescribed area without question even as long as in 1915”. 53

The Government’s dilemma and inertia was aptly exposed by the Commissioner of Patna Division, Maude. He argued that "as long as the Railways and District Boards are, as they inevitably must be, the worst offenders in damming up the natural drainage of the country it was impracticable for the Government to step in and lay down that no one shall make private bunds". 54

However, there was a strange situation now emerging. Although the private embankments were doing great harm to the drainage of the country, the people living in the protected areas had become so used to the embankments that any effort by the Government to withdraw it was now fiercely opposed by the people. For example, the Maliks of Majhaul in North Monghyr district, along with their servants began constructing a retired line in 1917, in an area which was brought under Section 76(b) of Embankment Act II of 1882, "by raising subscription from the tenant, of villages Barnarpur, Mirzapur, Musurar and Sirsi,

53 File No. II 1-2 of 1917, B progs., PWD(l), Bihar and Orissa, p. 31.
54 Ibid., p. 30.
without obtaining any permission". In reply to the show cause notice served to them, the Malikis contended that "... they have not constructed any new bandhs but merely repaired an existing bandh, which under the ruling in the case of Gobardhan Sinha versus the Queen Empress, has been held not punishable even though the repairs take the form of adding to the height of the existing embankment." The case was later dropped on the advice of the District Engineer of Monghyr, who argued, "the removal of the embankment in question would cause serious damage to a thickly populated and highly cultivated area".

Another supposedly 'bold step' of the Government towards controlling floods in a 'scientific' manner by constructing bandhs at a considerable distance from the river bed to enable the flood to be contained safely, was met with opposition from the people. P.C. Ghosh, Executive Engineer, wrote:

There have been many marginal bandhs in North Bihar but they have been badly designed. People naturally do not like to be left between the bandhs and the river and in deference to local inhabitants marginal bandhs have always been constructed as close as possible to the river bed (the Tiljuga case is a good example). The result is choking up of the channel, raising of the bed, bursting of the bandh and general havoc.

It is another matter that if the embankments had been constructed at a considerable distance from the river a larger area would have come between the river and the bandh, and consequently would have turned swampy and marshy, and thus unfit for cultivation. It would, no doubt, have been safer than other existing bandhs but sooner or later the same

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55 B. Progs. of PWD(I), Bihar and Orissa for August 1917, p. 7.
56 Ibid., p. 8.
57 Ibid., p. 8. The decision of the High Court in the above-mentioned case was later overruled by the decision of the full bench of the High Court in the case of Ayodhya Nath Koila. Ibid., p. 8.
problems would have cropped up. The limited area available for the river to deposit its silt load would have raised the riverbed level in some distant future.

The other group to whom the Government had to bow was the European planters whose opinions and interests were most valued and respected by the Government for obvious commercial reasons. For example, the Turki embankment, which as mentioned above was constructed by the Kanti Indigo Factory, was taken over and maintained by the Government, even though there was a difference of opinion regarding the retaining of this embankment at all. The history of this embankment shows that in 1833, 1852, 1860, 1861, 1868 and 1870, the bandh broke at the village of Turki, and that the repairs were invariably opposed by the Raja of Turki, but in each case the Magistrate or the Commissioner directed that the bandh should be repaired in deference to the opinions and interests of the proprietors of the Bikanpur and Kanti factories. The Executive Engineer, Gandak circle, and the Superintending Engineer also supported the requests of proprietors of these factories on the specious grounds that "it (the embankment) had been in existence so long that it would be better to retain it" and carry out the repairs.

The eagerness of the government to take over and maintain those embankments which gave protection to European interests, especially the Indigo planters, could also be explained by the fact that it was convenient to enter into an agreement with them- first, because the indigo planters themselves were keen to build embankments as indigo was very susceptible to floods and, second, it was easier to receive the annual maintenance costs from them. But the larger fact remains that the Government, at least till the last quarter of the 19th Century, was basically convinced about the efficacy of embankments as a means of

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59 Inglis, p. 370 (emphasis mine).
controlling floods. This is the reason why it always tilted in favour of embankments even if local indigenous opinion was against it.

The case of Tiljuga embankments shows that the control of the colonial government on the affairs at the local level suffered from inefficient and "untrustworthy supervision". It also becomes clear that big and powerful zamindaries, like the Darbhanga Raj, could flout and circumvent every rule and regulation without inviting sanction from the Government.60

3. Council Debate on Embankments and Floods

Throughout the early part of the 20th century the embankment engineers were trying to stop and discourage the construction of new embankments or, raising or strengthening of the older embankments as the flood and drainage problem had deteriorated. They had come around to the view that the rivers had to be left alone to carry out its land-building activity. Their knowledge about the river regime had also improved by then. The debate in the Legislative Council on floods and embankments clearly shows the direction that the policy on floods was taking. Ironically, the opinion of the Indian members of the Council had tilted in favour of embankments.

In 1922 on a resolution moved by Raghunandan Prasad Sinha, an informed debate was witnessed in the Legislative Council on the efficacy of embankments as a means of controlling floods.61

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60 For a study on the Darbhanga Raj see Stephen Henningham, A Great Estate and Its Landlords in Colonial India: Darbhanga, 1860-1942, Delhi, 1990.
61 "This council recommends to the Government that a general inquiry and examination by formation of a committee or otherwise should be made regarding embankment system (a) in a matter of greater facility for starting new works, securing co-operation of people concerned, incidence of taxation, maintenance, committee, etc., etc., and (b) for setting a definite plan and programme for prevention of heavy floods. XVIIIC-6/1922, B progs., PWD(I), B&O, p.1.
There was an opinion developing among the official circle about the problems of trying to 'control' the rivers. In fact, W.S. Brenner, Secretary, Irrigation Department, Government of Bihar and Orissa, had problems with the term 'prevention' of heavy floods because heavy floods depended on rainfall and nothing on earth could prevent them. He then made a distinction between floods in different rivers, and argued that the rivers should be left undisturbed:

...the Gandak flows in a channel from 3 to 4 miles wide and only about within that area. There is an embankment on both sides of the river and these can be maintained, provided they are looked after properly, against any flood that is likely to come down. The Bur (Burhi) Gandak, flowing east of Gandak, brings drainage from practically the whole of Champaran and a good deal of Muzaffarpur district. This river has a fairly stable main course. The difficulty is that the rainfall which produces flood in the Bur (Burhi) Gandak rushes down the Himalayas and the steeply sloping country adjoining the Himalayas. The whole of the hilly country is liable to very heavy cloud bursts, and when the rivers rise in flood together there is a high flood. At this time you get a state of affairs that no embankment can cope with. If you had embankments this river would do more damage than it actually does. Further east we come to rivers that lose their stable course and the main reason for this instability is that the river is bringing down a very large volume of solid matter. When it comes down from the hills it carries the solid matter with it. As soon as it reaches the level plain and the velocity is reduced, the solid matter deposits close to the bed, a mile or two on both sides and in the bed itself. The result is that the bed of the river with the land immediately adjoining rise with comparative rapidity so that within a period of 8 to 10 years you find the bed of the river a several feet above the level of the surrounding country. It then breaks through and starts a new course on a lower level...as long as these conditions prevail, the formation of new lands in this way must continue.

He further added that "the construction of embankments along the Kosi, Kamala, Bur (Burhi) Gandak and Bagmati would only accentuate the danger which we are now suffering from...Most countries are better off without embankments provided we make arrangements for draining the water quickly from the land submerged... The mere fact of this water

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62 Ibid., p.3.
coming over the land quietly does not as a general rule do any harm. It is only when you get this water rushing into the land at a high velocity that causes great damage. 63

Brenner also mentioned the case of the Tiljuga (which has already been discussed earlier) which was then in the civil court and considered it as an abject lesson in the matter of embankments. Finally he felt that it was quite impossible to make any program that could prevent floods recurring. 64

But an interesting point emerging from this debate was the opinion of most of the Indian members of the Council, which was in favour of building more numbers of embankments to prevent the annual 'havoc' created by the rivers. Colonialism had already produced its 'converts'. For example Swami Vidyanand stated during the debate that 65:

...people are aggrieved due to the non-existence of sufficient embankments...The rivers of North Bihar change their course often...One or two years ago river Kamala was over flooded and thousands of acres of lands were destroyed...if an embankment is constructed there, people of that area will be saved from the difficulty...The Kosi river changes its course always after 3-4 years. My friend has referred to the litigation between the landed magnates of North Bihar about the embankment in their zamindari (Tiljuga embankment)...that embankment is not sufficient. If embankments are constructed upwards up to the source of the river and downwards up to the mouth, that will save the tenants from much difficulty...road cess which is paid by the tenants may be utilized for constructing embankments and they should not be required to pay any further for them.

Another Indian member, Dvarika Nath, criticized the government for not having a consistent policy and urged that the flood problem required a larger expenditure than what was being spent then. He also believed that a separate department to look after floods was the need of the hour. Another Indian member, Purnendu Narayan Sinha, although having a

63 Ibid., p.4.
64 Ibid., p.4.
65 Ibid., p.1.
better understanding of the situation, still believed in the efficacy of embankments in solving both the irrigation and drainage problem. He argued\(^6^6\):

...I believe the question of irrigation is intimately connected with the question of embankment...I believe some useful purpose will be served, if following the lines of the Irrigation Bill, the embankments be divided into three classes, viz., private embankments kept up by private people, embankments kept up by village agencies, and embankments taken up by the Governments...I believe much litigation may be avoided if in the big embankments that are in existence due provision be made for sluices and flood gates. Embankments serve the purpose of irrigation and also of drainage. These two are sometimes conflicting interests and people on the two sides of the embankments get conflicting interests in the matter of irrigation and drainage.... Costly litigation may be avoided by expert advisors of the Government devising upon some means by which both irrigation and drainage may be done.... The Embankment Act is largely out of date. I believe that there should not only be district embankment committees but also divisional embankment committees because where a large question is involved, generally such embankments affect the interests of more than one district.

Sinha made some very important and informed observations, especially on the inter-relationship between irrigation and drainage. However, his solution, of providing sluices and flood gates in the embankments, was a proven failure already. In most of the cases the sluices were rendered useless because of the silting up of the approach channels to them.

Thus, the growing feeling and opinion of the Indian members was that the embankments were the only solution to the flood problem of North Bihar, and that the colonial Government was not putting enough effort or money on this. This fact assumes greater significance in the light of the experience in the post-Independence period in North Bihar when the Government went on an embankment-building spree.

The colonial government, on its part, had reached a consensus that embankments were not the right solution for the flood problem. It had also started looking at the problem

\(^6^6\) Ibid., p.8.
from a broader perspective. It constituted Embankment Committees comprising of several contiguous districts as well as other advisory bodies to advise the engineers and other authorities directly involved in the building and upkeep of embankments. This was a big step forward as earlier the District authorities had a very local and narrow view of the flood problem leading to a lot of complication, some of which has already been discussed.

3.1. Floods and 'Committee Control'

The Flood Committee of 1923 consisting of technical as well as non-technical members remarked, “the flood problem is one which it is not possible to solve completely by any local action. The only method by which flood can be completely controlled is by constructing retaining basins (or dams) at a sufficient number of places in the upper reaches of rivers to enable a flood to be spread over a long period which will enable the channels to carry off the drainage without overflowing their banks.”

This was the first time that the idea of dams or retaining basins came up for discussion. The Committee was of the opinion that the cost of this method of flood protection was altogether prohibitive in a country like India. It was also felt that retaining basins were not possible in the province because the upper reaches of the main rivers were outside the boundary of the province. What is interesting to note here is that members of the committee had not appreciated the importance of chaurs, jheels and other low-lands, which in a way were retaining basins. Flood water was retained in these low-lands till the flood level in the rivers had subsided, after which water was drained back from these low-lands into the rivers. The logic behind the construction of retaining basins (or dams) in the hills seems to be to reclaim the low-lands in the plains for cultivation.

This Committee believed that whatever action was taken in the lower reaches of rivers could only be palliative. The channels of all rivers adjusted themselves to carry the normal discharges and any sudden increase above normal could only be met either by continuous embankments or by allowing the rivers to spill over their banks. But the Committee was generally of the opinion that the construction of continuous embankment on any of the rivers was not desirable and was attended by dangers. 68

The Government of Bihar and Orissa appointed two standing Flood Committees with effect from 1 April 1925, one for the area affected by the Son and upper Ganges and the other for the area affected by the Kosi and the lower portion of the Ganges. The second committee was split up in two committees with effect from 1 April 1934, one for the Gandak and middle Ganges and the other for the Lower Ganges and Kosi. These three Advisory Committees were to advise the Government on the problems connected with floods. 69

In the year 1927 the Government of India inquired whether any useful purpose would be served by the appointment of a Central Committee to examine the causes of recurring floods or whether local inquiry would be more useful. The Local Government in reply stated that they considered that such a central inquiry might have its uses as a co-coordinating agency and as a corrective to any narrowness of outlook on the part of the local government, but they doubted whether in itself it would be of much practical utility. The Government of India decided not to take any further action in the matter, as there was no general demand for a central inquiry regarding the causes of floods. 70

68 Ibid.
69 XVIIIIC-10/1936, B progs., PWD(/), GoB, p.4.
70 Ibid., p.5.
In addition to these committees, a temporary Waterways Division in North Bihar under the Executive Engineer was formed after the earthquake of 1934, which carried flood observations in the districts of Muzaffarpur, Darbhanga and Champaran and it also surveyed the area affected by the Kosi floods. The Executive Engineer submitted detailed North Bihar flood reports for 1934 and 1935.71

This was a positive step in the direction of dealing with the floods in a much more comprehensive manner. Each river basin was taken as a comprehensive unit, and any action to be taken was to be keeping in mind the whole river basin. Till the 1920's floods were dealt with in a very localized manner with each village, zamindari estate, pargana, and district acting on its own without thinking of the consequences of their action on the others. The inter-Provincial Flood Conference held in Patna and Lucknow was also the outcome of this thinking. However, this newfound wisdom did not get reflected at the ground level, as it was amply evident from the Tiljuga embankment case. Also, this wisdom came a bit too late, after more than a century of messing up of the agro-ecological setting. In a lot of places irreversible damage had been done to the drainage network. Any effort to undo these damages was challenged by the vested interests that had developed in a number of places.

4. Policy Shifts: Embankments to Drainage Schemes

During the late 1920's and 1930's the attention of the engineers had turned towards devising drainage schemes for a number of chaurs and other low-lands which remained perpetually waterlogged due to the complete destruction of the complex drainage network by the construction of embankments and railways and roads. By not allowing the silt-laden waters from spilling in the countryside, the land-building activity of the river was disturbed. While

71 Ibid., p.6.
the bed level of the rivers kept on increasing because all the silt got deposited on the river bed itself, the level of the countryside remained the same as it could not receive the silt from the river spill. The relative bed level of the river and the countryside (including chauls) increased. As we have already discussed, rivers eventually received all the drainage of the countryside after the floods had receded. But due to the increased bed level of the rivers the confluence of the rivers and drainage channels became clogged. Thus, most of the chauls dried up only by evaporation and percolation. This way the chauls remained waterlogged for a longer period. The chaur lands, which allowed a rabi crop to be grown each year after the water had drained, remained waterlogged till late January and good rabi crops could not be grown here. Also, the swamp rice that was grown in the chauls, and which required not more than three feet of water, was also destroyed as the water level in a lot of the chauls reached more than six feet.

To correct this problem need was felt to devise schemes for the drainage of these lands. A lot of drainage schemes were prepared but due to certain reasons none of them could be implemented. The most important reason was the refusal of the beneficiaries to pay for the cost of the schemes. In most of the cases the cost of the scheme was very high, and the beneficiaries’ refusal to pay was understandable as the benefit of the schemes was not certain as long as the root cause of the drainage problem (i.e., the embankments) existed. Let us study some of these cases more closely.

4.1. Sondho chaur drainage scheme

This chaur in the Mahura thana of the Hajipur subdivision, Muzaffarpur district was a badly drained depression where rainfall run-off from a catchment area of 15 square miles
accumulated. Except in years of deficient rainfall an area of about 1300 acres was submerged to a depth of about 6 feet.

It was customary to grow ordinary rice in the margins of the chaur and swamp rice (jesri) in the central lower area of about 900 acres. The jesri rice required not more than 3 feet of water and was injured if it was submerged for more than 6 days. 72

The Executive Engineer reported that the blame was to be put on the cultivators who used the river beds for indiscriminate cultivation. 73

The water in the chaur stands to a depth of about 6 feet during the rains and naturally all the crops in the chaur area perish.... The None river into which the chaur will drain is not in a very efficient condition itself, although at present it is capable of draining the chaur; that its condition is deteriorating is certain...the main responsibility lies with the cultivators themselves who resort to indiscriminate cultivation of river beds and natural drainage channels; this is more general than exceptional in this part of the country.

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The cost of the scheme per acre came to 75 rupees and 6 annas. The whole scheme was left in abeyance as it was considered economically unviable.

4.2. Nagwan chaur scheme

The Nagwan chaur, in Muzaffarpur district, was a depression of about 4 miles long and 1¼ miles wide where the monsoon run-off from a catchment of about 35 sq miles accumulated over an area of about 3628 acres the maximum depth of water being about 6 feet except in years of abnormally low rainfall. The drainage of the chaur was inadequately effected by an

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73 'Report on the Sondho chaur drainage scheme', Executive Engineer, dated 22-11-1930, Ibid., pp.1-3 k.w. Beds of rivers and drainage channels were used by cultivators to grow vegetables and other crops during the summer season. The soil of the river bed was particularly suited for growing vegetables, and due to the high water table temporary katchcha wells could be easily built without much effort and cost.
artificial drainage channel about 3 miles long connecting up the lower end of the chaur and None nadi, a shallow natural drainage course. This existing drainage system was defective because of a number of factors; first, a small drop of 3 feet between flood levels in the chaur and None nadi, second, drainage cut was narrow, it was not properly maintained and was even cultivated and bunded for fishing, and, third, there were four road culverts in its course with insufficient waterways. The Chief Engineer reported, "the landowners and tenants did not wish the entire chaur area to be drained but desired to retain 3 feet depth of water over the lowest area where a special variety of swamp rice is grown."74

The Superintending Engineer reported, "the river None is circuitous and is said to be deteriorating and silting up in its bed. This river eventually finds its way into the Baya river. So the proposal for the general improvement of the Bya channel may, if carried out, have some beneficial effect in the future on the condition of the None river in its lower reaches."75

The scheme was also put in abeyance because the supposed beneficiaries were not ready to pay for the scheme. Most of the tenants cultivated in the chaur on the short term batai (share-cropping) system and had no permanent hold on the land. They were therefore not willing to meet the cost. The landlords and kast tenants also did not show much interest as the low prices of agricultural products had affected the rural population.76

4.3. Hardia chaur drainage scheme

In 1926 the Hardia chaur, in Saran district was flooded during the rains and even after the flood season was over a major portions of it remained under water till late in the month of

74 'A note by EL Glass, CE Irrigation on the project for the drainage of the Nagwan chaur in the Muzaffarpur district', dated 22nd June 1931, VIII D-6/1931, B progs. PWD(I), B&O, p. 19.
75 'Note by Superintendent Engineer', dated 26th April 1931, Ibid., pp.15-16.
76 Ibid.
December, with the result that part of the area remained *parti* (uncultivated) and part was sown with *rabi* very late which gave a poor outturn. The higher portion on which broadcast paddy was sown well before the rains started, gave an outturn which varied from almost nothing to a very good crop according to the rainfall of the year.

The reason for the drainage problem in the Hardia *chaur* was due to the fact that it was bounded by the *retired line* of the Saran embankment on the east, Bengal and North-Western Railway line embankment on south and west, District Board road from Sitalpur to Parsa on the west and comparatively high ground on the north. Approximately its area was 45 square miles. The only important natural feature of the area was the Mahura *nulla* which flowing zigzag in a southerly direction fell into the river Gandak.\(^77\)

The Mahura *nulla* ran along a ridge within the *chaur* considerably higher than the average level of land on the either side. Consequently the banks of the Mahura were much higher than the *chaur* lands. This might have been due to the *chaur* not receiving the silt-laden waters of the rivers due to the embankments and consequently the relative bed level of the rivers and the *chaur* increased. When the flood season was over and the river Gandak started falling, the Mahura gradually drained the *chaur* till the water level fell below the banks of the Mahura. After this the Mahura could not drain any more water, which still covered a very large area, and it was by absorption and evaporation alone that it gradually dried up till late in December.\(^78\)

The Hardia *chaur* not only got flooded by backing up of the Gandak through the Mahura but also by the local rainfall which had no drainage up to a certain level (i.e. the

\(^77\) 'Contour Survey of Hardia Chaur', Executive Engineer, dated 12th June 1926, XVIIS-2/1928, B Progs., Irrigation Department, B&O, p.3.

\(^78\) Ibid., p.4.
bank level of the Mahura), by country floods coming from the north-west corner of the chaur from a very long distance and by spills from the Ganges and Mahi rivers entering from the west and south sides. Thus it was not possible to prevent its flooding at any reasonable cost. 79

The Executive Engineer prepared a scheme in 1926 to drain the Hardia chaur by the month of November, exposing the area for cultivation. In 1929 it was decided that a suitable method of financing the scheme would be for the Government to grant land improvement loans to the cultivators and to utilise this loan money for construction work. As regards apportionment of the cost amongst the beneficiaries, the Chief Engineer observed that 80:

It would be difficult to demarcate on the ground the boundary of the area which the scheme is designed to benefit and if it is decided and agreed upon that all areas within that boundary shall be assessed at a uniform acreage rate the only difficulty will be to apportion the assessment amongst the landowners and tenants. Although it will undoubtedly be the case that some areas will benefit more than others it seems hardly possible to differentiate before the works have been constructed and the results obtained have been observed for at least 4 years of operation. It is strongly recommended therefore that a uniform rate of assessment be insisted upon by Government.

But problems were encountered in finding out a proper mechanism of apportionment and recovery of the cost from individual beneficiaries of the scheme. None of the drainage or embankment acts provided satisfactorily for this case. Under the Embankment Act of 1882 it was not possible, under section 61, to recover more than Re. 1 per acre per annum, excluding interest. The cost of the Hardia scheme, however, worked out at about Rs.25 per acre, excluding interest. This meant that the recovery would have to spread over 25 years. The Government was not ready for this.

79 Ibid.
80 E.L. Glass, Chief Engineer, Irrigation, dated 6th May 1931, Ibid., p.45.
Under the Drainage Act the procedure was too cumbersome, with its provision in Part 1 for the appointment of seven Commissioners, of whom the majority had to be non-officials, who would have to apportion the costs and dispose off the objections. Moreover, the Act only provided for a levy on landlords and tenure holders. They in turn, under Part 5, had to recover the costs from the tenants under them, either by enhancing the rents by suits, or by recovery of the actual apportioned cost of the work. In the latter case the apportioned cost could be recoverable as if it were rent, and this also required a suit. Under the Minor Irrigation Act, again the cost was recoverable from the landlords, and they in turn could recoup it only by an enhancement of rent under section 24 of the Act. The Government felt that the landlords would not agree to this course.

The District Officer of Saran reported that the people interested in the scheme had expressed their inability to finance the scheme. The persons were not interested to take Land Improvement Loan from the Government. Under these circumstances the Board of Revenue recommended that the scheme be dropped for the time being. 81

4.4. Warisnagar thana drainage scheme

Warisnagar thana in the Darbhanga district, situated between the rivers Bagmati and Burhi Gandak got flooded during the monsoon. The floods in this thana was caused when both the rivers were in high flood simultaneously, and the railway bridge over the Burhi Gandak lower down could not pass the whole discharge.

To reduce the flood it was suggested in 1927 that a portion of the Punwa bandh, a private bandh, on the left bank of the Bagmati be taken over and removed. However, the

81 District Officer, Saran to the Commissioner of the Tirhut Division, dated 9th July 1931, ibid., p. 47.
proposal was later on dropped owing to the people, whose lands were protected by the bandh, raising serious objections. Also, it was found that the removal of the bandh could not do away with the problem. The thana abounded in chaur which, being lower than the river banks, could not be drained and remained water-logged for several months after the floods subsided, with the result that no crops could be grown on a considerable area.82

In 1923 investigations showed that the Bagmati below Haya Ghat was a dying river and a greater part of its water passed into the river Kareh to the north of Warisnagar thana. The inundations were merely due to the local flooding of the Bagmati and it was decided in 1924 that a solution would be found simply by draining the Warisnagar basin into the Bagmati channel west of the Punwa bandh, after the floods or during the intervals between floods. Accordingly a scheme for the draining of the basin was prepared in 1927.83

An estimate for the drainage of the chaur after the flood season amounting to Rs.179,000 was submitted. The total area estimated to be reclaimed was 17,520 acres.84 In the proposal no diminution of flooding was contemplated and "it was not expected that the proposed drainage would afford material protection to the rice crop but only permit of draining the low-lying areas in time to permit of Rabi cultivation."85

The example of Hardia chaur drainage scheme clearly showed that the colonial government was ill prepared to carry out any of the proposed drainage schemes. First, it did not have the presence in the local community to bring about a consensus of opinion among them about any scheme. Second, it did not have any mechanism by which it could implement the project, force the zamindars to pay for the scheme, or to devise an agreeable

82 XVIIIS-5/1929, B progs, Irrigation Department, B&O, p.7.
84 Ibid., pp.7-8.
85 A note by EL Glass, Chief Engineer, dated 31st May 1928, Ibid., p.19.
mechanism through which the zamindars could recover the money from the tenants. The existing laws did not provide a satisfactory mechanism for an agreeable arrangement.

Another important point which comes out is that though the Government, by the 1920's, gained the wisdom that drainage, rather than flood control was the most important issue in North Bihar, the wisdom came a bit too late. The river regime and the drainage network were disturbed, and in some cases the damage was irreversible. Most of the drainage schemes would have brought only a temporary relief. As long as the cause of this deterioration, i.e. embankments, railways, roads, etc., remained, the problem was to surface again in future. All the efforts and money put on any of the drainage schemes would have eventually gone down the drain.

That the government was ultimately bound by its colonial compulsions is evident from the fact that it always conveniently pointed out that it was for the actual ‘beneficiaries’ (zamindars and tenants) to pay for any public works in Permanently Settled areas as the government had limited its share of the land revenue. What it conveniently overlooked was that the actions that it had taken in the past had largely contributed to the destruction of the drainage network. So in all fairness either the government paid compensation to the affected people or should have financed the schemes from their own funds. The other more general issue was that the colonial government’ real concern was revenue. Its attention towards floods was actually for that. It thus refused to enter into an arrangement where it could have to incur expenses. It tried as far as possible to put the real burden on others. When that failed, the project was stalled.
5. Inter-Provincial Problems and Co-operation in Flood Control: Gogra Floods

As has already been mentioned, the colonial Government was trying, from the 1930's onwards to co-ordinate the flood control measures between different districts falling in the same river basin. From 1936 onwards a positive development was the organising of Inter-Provincial Flood Conferences between the Governments of Bihar and United Provinces to devise means to tackle the problem of Gogra floods, and more importantly to avoid taking such individual action which might in future become detrimental for the interest of both the provinces.

5.1. Inter Provincial Flood Conference, Lucknow, 5-7 January, 1939.

The Flood Conference in Lucknow was held mainly to devise ways and means to resolve the dispute between Bihar and United Provinces (U.P.) on the question of controlling the floods of the river Gogra. The Government of Bihar complained that the actions of the Bengal and North Western Railway (B&NWR) had led to increased and abnormal floods in the Gogra valley in Bihar, and it wanted to erect some embankments in its Province to safeguard its own interests. (It has already been discussed in this chapter the effects of the Chapra-Ballia railway line on the floods in Saran district). The Government of U.P. wanted to stall Bihar Government’s proposal to construct any embankments on the Gogra as that would have increased the flooding in the Gogra valley in U.P. The concern of the B&NWR was mainly financial, as it did not want to construct any waterways on its embankment, or enlarge the existing waterways.

Although the Technical Sub-committee (Lucknow Conference) did not say boldly that the Inchcape Bridge at Manjhi should be widened to allow more waterway, but it could
be seen from the general body of resolution that the committee accepted the fact that between Reoti and Manjhi the distribution of water on either side of the railway embankment was not equal. The committee was very insistent that no *bandh* should be allowed to be constructed on the Saran side. The Bihar representatives had to fight against the U.P representatives and the Railway representatives and managed to get the resolution worded that *no continuous bandh* could be constructed. This also meant that *bandhs*, where necessary, could be put up. 86

The Bihar delegates pressed for the construction of a marginal *bandh* in the Saran district, along the Gogra, as they were authorised to do this at the preliminary conference at Patna. When the Bihar representatives realized that the B&NW Railways and U.P. would not agree to the construction of this *bandh*, they requested that adequate openings should be provided in the Ballia-Chapra railway embankment including extension of the waterways of the Inchcape Bridge, for escape of spill water into the Ganges on the U.P side of the Gogra. (See Map No.8) The U.P engineers would, on no consideration, agree to the construction of the marginal *bandh*; although they could not question the practicability of such a *bandh* in view of the long-standing embankments that existed on the Gandak, they maintained that very adverse conditions would be caused by the construction of this embankment. 87

The alternative of providing extra waterways in the Ballia-Chapra railway embankment was at first favourably considered by the members of the expert committee, with the exception of the Chief Engineer of B&NW Railway, who maintained that the same were unnecessary and would result in high cost to railways in construction and maintenance.

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87 Ibid.
The discussion then veered around in favour of the railways. It was considered that the railway embankment did perhaps as much good as harm, especially in the prevention of the Ganges flood in the Ballia district and that an embankment without openings was perhaps necessary for the proper training of the river through the Inchcape Bridge. There was doubt also that the said bridge could be maintained with a greater number of spans.\textsuperscript{88}

A majority of the committee members concluded that further investigations should be made before any openings in the railway embankments may be pressed for or further spans in the Inchcape Bridge are added. The Bihar engineers dissented from these conclusions, as, to them, it appeared clearly evident that the railway embankment blocked the spill area of the Gogra at its confluence with the Ganges and that the widening of the said bridge would also relieve the flood spill.\textsuperscript{89}

The Technical Committee also decided that the detailed survey of the Gogra valley in the Ballia district, which was under preparation by the United Province Government under A.P. Wattal, should be carried out in the Saran district as well. Accordingly an Assistant engineer of PWD, Bihar under the direction of Wattal carried out a survey in Saran district. The report of this joint survey conducted by the experts from Bihar and U.P. observed that\textsuperscript{90}:

\begin{itemize}
  \item[a)] The raising of the flood plane due to the closing of the natural spill channel by the railway approach embankment to Inchcape bridge aggravates the spilling of the Gogra flood from Guthni on the left bank....The total combined waterway at maximum flood on these openings adds up to 5,542 sq. feet....The waterway required works out to 17,771 sq. feet necessary to relieve the undue afflux at present being registered in the culverts on the Bihar side of Gogra valley.
\end{itemize}

\textsuperscript{88} Ibid.  
\textsuperscript{89} Ibid.  
\textsuperscript{90} Ghosh, \textit{op. cit.}, p.5. (emphasis mine)
b) Since the Ballia side of the Gogra represents the natural outlet of the river into the Ganges it is recommended that additional waterway necessary to lower the flood plane consequently reducing the high afflux at present being registered on the railway culverts on the Gogra valley between Chapra and Ekma, be provided between the approach embankment between Reoti railway station and the Inchcape bridge at Manjhi, forthwith by reopening and suitably enlarging the existing Kol *Nala* culvert to enable it to discharge approximately 35,803 cusecs into the Ganges before reaching Inchcape bridge.

c) It also suggested for the consideration of the Bihar Government that after a suitable outlet for the overflow of the Gogra flood in the Ganges valley has been provided under the railway approach embankment they should seriously consider the dismantling of the *Naini bandh* and ensure corresponding openings under the Chapra-Mashrak railway line to enable the Gogra left bank spill to pass harmlessly into the Ganges via Jhaua *Nala*....

In order to go into further details and check Wattal's report another Inter Provincial Flood Committee met in November 1939 and the Technical Sub-Committee appointed visited several important sites in this connection from 1st to 5th February 1940. P.C. Ghosh, Executive Engineer, PWD, Bihar represented Bihar in the Sub-Committee and in his report to Government after the inspection of the sites remarked as follows91:

a) The gradual raising of the flood surface consequent on the raising of the Gogra bed since its obstruction by the Inchcape bridge without provision of any waterway in the Chapra-Ballia railway embankment has been responsible for the gradually increased spill flow from Guthni to Dumri on the left bank.

b) The allotment of 35,803 cusecs into the proposed escape channel at Kol *Nala* seems to have been underestimated as no account has been taken for additional discharge of 50,000 cusecs that would come into the Gogra due to the proposed diversion of the upper Sarju into it. Moreover 35,803 cusecs would hardly pass into the Kol *Nala* as anticipated, because the left bank being considerably lower than the right would spill over in a length of 35 miles from Guthni to the Kol *Nala*. Therefore the Guthni-Chapra road from Guthni to Dumri for a distance of 40 miles should be raised to about 3 feet above the H.F.L (Highest Flood Level) of 1936 (maximum on record) with necessary masonry spillways to cope with a discharge of 19,397 cusecs as allotted to Saran district in Mr. Wattal's report....

91 *Ibid*, p.6. (emphasis mine)
A second Interim Inter-Provincial Flood Committee met at Patna from 19th to 21st March 1940 to consider the recommendation of the Sub-Committee. During the course of the discussion on Wattal's final flood report for the provision of openings on the Reoti-Manjhi railway approach embankment, Izat, the B&N.W. Railway representative in the Committee, produced an old map which showed the direction of flow of the Kol nala as being towards the Gogra. This survey was made prior to the construction of the railway line. The Committee, however, agreed that there was evidence to show that the Kol nala flowed in either direction according to actual flood conditions at the time. After a full discussion of the subject, the Committee agreed to recommend to the concerned Provincial Governments that the Central Hydrodynamic Research Station at Poona should be requested to carry out model experiments. The experiments were to be made to determine the possible effect on the flood plane of the Gogra River if the railway embankment at Kol nala was provided with openings capable of discharging up to 35,000 cusecs when 800,000 cusecs was passing through the Inchcape Bridge, as was the case in 1938.92

Inspite of the fact that the two Provincial Governments were in the process of chalking out a mutually beneficial program of flood control in the Gogra valley, the Bihar Government went ahead with repairs to some of the zamindary embankments on the left bank of the Gogra which were breached during flood of 1938.

The Admapur bandh, on the left bank of the Gogra, was repaired by the government in 1939 at a cost of Rupees 8,701 for the length of 5 ½ miles, from village Sahpur to village Tiar. The Tajpur bandh, comprising of three bandhs of ¾ mile lengths each along the left bank of the Daha near its outfall into the Gogra, was intended to check the overspill of the

92 Ibid., pp.6-7.
Gogra which found its way up the Daha. All these were repaired by the Government in 1939 at the cost of Rupees 2,571, and taken over and maintained by the PWD. Naini bandh, on left bank of the Tail nala, was repaired in 1939 at the cost of Rupees 4,868 and taken over and maintained by the PWD. The main purpose of this bandh was to check the eastwards spread of the overspill of the Gogra therby protecting the town of Chapra. The Sitalpur system of bandhs, comprising of three sections, damaged badly during the flood of 1938, was repaired by the Government in 1939 at a cost of Rupees 4,054.93

The decision of the Bihar Government to go ahead with the construction of these bandhs may be judged somewhat sympathetically considering the havoc created by the Gogra floods after the erection of the Railway embankment, especially during the floods of 1921, 1923, 1934, 1936 and 1938. A brief description of the flood of 1936 in Saran district would not be out of place here.

5.2. Saran Floods, 1936

The flooded area extended from east to west of the Saran district along the banks of the Gogra and Ganges except for small areas at Chapra and Dighwara which were protected by the railway embankment. The flooded belt in its greatest width reached about 11 miles. The flooded area may be divided into three parts, viz.: 1) the northern bank of the Gogra river, caused by the numerous breach of private embankments and flooding of low lying country adjacent to the river; 2) the partial flooding of Chapra town, and; 3) the flooding of the

93 Ibid., pp.9-10.
northern bank of the Ganges from the Naini bandh, which was about 5 miles west of Chapra, to the eastern extremity of the district.  

The junction of the Gogra with the Ganges was moving westwards and by 1936-37 it lay to the west of the Chapra town instead of to the east as previously. Early in the rise the Gogra over-topped its bank at Darauli and Guthni and subsequently burst its banks and breached all its bandhs in the Darauli and Raghunathpur thanas. The flood water made its way inland for a distance of six to eight miles filling and joining the jheels there and made its way steadily eastwards.  

Owing to the backwash of floodwater from the Gogra the Daha nadi which flowed into the Gogra near Siswan village also flooded its banks until an area of over 100 square miles had been flooded. In this area the bhadai crop was totally ruined. All the district board roads in the flooded area were under water and were breached in several places. All the village bandhs had also been breached and destroyed.  

Apart from a certain amount of percolation through the sluices in the railway embankment north of Chapra the whole water which entered the town had come from the Tel nadi at the western extremity of the town. There was no serious flooding by the Ganges from the east. The Tel nadi served to drain a large chaur into the river but when the river was in high flood the water poured back into the chaur. Owing to this flooding a very large

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94 Commissioner, Saran to Secretary, Revenue Department, dated 18th August 1936, IVF-43/1938, B progs., PWD(I), GoB, p.2.  
95 Ibid., p.3.  
96 Ibid.
part of the northern part of town, including large stretches of the main road had been submerged. 97

The flooding from Chapra to Sonepur was caused by the breaching of the Naini bandh, which ran from north to south about five miles west of Chapra town, and the Tajpur bandh lying further to the west. By the breaching of the Tajpur bandh on 8th August the floodwater was released towards Manjhi. The Naini bandh gave way on the 11th by which time most of the Manjhi thana was flooded. With the breaching of the Naini bandh floodwater poured eastwards north of Chapra town and proceeded towards Sonepur flooding the whole of the area between the Ganges and the Gandak for several miles inland. 98 The Commissioner of Saran reported that "a large part of the affected area in the neighbourhood of Sonepur is paddy land, and unless re-transplantation can be carried out the effect of the flood will be serious." 99

The Saran Flood Committee appointed to investigate flooding in the Saran district gave certain recommendations 100:

a) The road from Guthni to Harpur should be raised for about 2 miles to prevent the spill from the Gandak river flowing to the east.

b) The road from Guthni to Chapra should be raised from 14th mile from Chapra.

c) The embankment on the left bank of Daha nala should be taken over by the Government and strengthened and be continued up to village Chainpur.

d) Naini bandh should be taken over by the Government and strengthened.

e) Additional waterways should be provided in the railway embankment between Chapra and Khaira stations. The Railway Representative in the Committee

97 Ibid., p.5.
98 Ibid., p.7.
99 Ibid., p.9.
100 Ibid., p.10.
dissented from this proposal. He opined that this proposal was not required if the Naini bandh is taken over and maintained, as it should be.

f) To prevent the flooding of Chapra town from Gogra floods a certain local board and municipal road should be raised.

g) Embankment should be constructed on the south-east side of the town to prevent the Gogra water entering it.

Saran district was suffering increased flooding because the concentrated spill of the river Gogra was entering the district, as it could not find an escape in Ballia district of U.P. because of the Railway embankment. Ironically, the debate between the government of Bihar, on the one side, and the Government of U.P. and B&NWR, on the other, was actually not on the question of efficacy of embankments as an effective solution for floods, as it was made out to be. The former wanted to build some embankments on its side of the Gogra valley, while the latter, though arguing against embankments in general, and Bihar's proposals in particular, was refusing to remove the existing Railway embankment or to provide adequate waterways on them. The reason why the Government of U.P. was supporting B&NWR was because the Ballia-Chapra Railway embankment was obstructing the floods of the Ganges from entering Ballia district, as well as helping to prevent the flooding of the Doaba pargana in Ballia from the spill of Gogra. Thus, while the organizing of inter-Provincial conferences and consultations was a positive step, it was very evident that embankments had created strong interest groups. The financial and political implications of dismantling embankments which were in existence for a long time were too dreadful for the colonial government. In fact, the colonial government was under pressure to provide new embankments to protect areas which were adversely affected by the existence of older embankments.
6. From Embankment to Dams and back to Embankments: A Case Study of Kosi

As we have already discussed, by the 1940's considerable opinion had been built within the colonial government against the very idea of controlling deltaic rivers. If any new embankment was being constructed, or any old one extended or strengthened, then it was not because of the encouragement of the colonial government, but due to other reasons, which have been already discussed. In this period an opinion was gaining ground among the engineers to control the rivers in the hills itself, before they entered the plains, by constructing retaining basins (or dams).

A lot was written about the river Kosi, especially about its oscillation or more rightly its westward movement, its violent behaviour and its silt content. No attempt was made by the Government to embank or control the main stem of the Kosi as was done with other rivers, except for repairs made to the Bir bandh by the Nepal Durbar and by the British Government from time to time. But a lot of private marginal embankments were constructed by zamindars. Apart from these private embankments, the extension of Railways in the area, especially the Barauni-Katihar line, with insufficient and inadequate waterways also disturbed the natural working of the Kosi. Some rivers of the Kosi system of rivers were also embanked leading to worsening of the flood situation. A prime example being the Tiljuga, which by the 1930's was receiving a lot of Kosi discharge.

The reason why there was no attempt to control the main stem of the Kosi was its high discharge, high velocity and the vast amount of boulders, pebbles, silt, etc., which it brought down. Of the above three factors, the last one was the most important. The westerly movement of the Kosi, which was the most dreadful feature in the destruction of the area, was solely because of the raising of the country through which it flowed. The Kosi deposited
a vast amount of silt and other materials it brought from its catchment area in the hills. Later it adopted a new channel where the level of the country was lower. The experience of trying to control the Kosi by means of embankment (Bir bandh and Tiljuga bandh) convinced the engineers that if at all the Kosi had to be controlled; it has to be done in the hills by means of dams. The idea was to regulate the flow of the Kosi, so that its velocity was reduced and its silt was not allowed to enter the plains; Kosi without its heavy silt load could then be easily controlled in the plains.

The first time a proposal to dam the Kosi in Nepal, probably was given by Jimut Bahan Sen in the Patna Flood Conference in November 1937. He argued that embanking the river was no remedy and "the only possible means to check the Kosi was to dam it where it left the hills and regulate the flow past the weir but there were two great obstacles- the dam site lay in Nepal territory and the cost would be enormous."\(^\text{101}\) It was also in this Conference that the Chief Engineer of Bihar, Captain G F Hall, argued not just against embankments but talked about a constructive policy of removal of all obstructions to river flow. He also doubted whether Bihar could afford to spend an initial Rs. 10 crore on training a single river with uncertain results.\(^\text{102}\)

Sir C.C. Inglis, who was then Director of the Central Irrigation and Hydrodynamic Research Centre, Poona, studied the Kosi in 1941. According to him, the Kosi would continue its westward movement till its sediments filled up the low lying areas of the Tiljuga and the Balan and then, possibly the higher land elevation, south of Tamuria, would prevent it from further moving to the west. He felt that a marginal embankment might be needed

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\(^{101}\) *Proceedings of the Patna Flood Conference, 1938*, p.29.
here for stopping the river from moving west. He also thought that erosions, landslides, deforestation and extension of agriculture were responsible for floods.¹⁰³

P.C. Ghosh, Executive Engineer, who was given the responsibility to study all the rivers of North Bihar in, came up with a comprehensive report in 1942. His opposition to embankments is reflected in this report. Ghosh suggested construction of weirs across the tributaries of the Kosi in the mountainous region. The reservoirs formed by these weirs would act as retarding basins at the time of floods. His suggestion also included redistributing the Kosi discharge into two channels, viz., the Kosi and the Sursar at Chatra by erecting extensive barrage works at the point of bifurcation. The discharges brought down by the Kosi and the Sursar channels lower down could be further distributed into various dead channels. This way the area could be build up uniformly. It was, however, admitted that data available at that time was inadequate to arrive at a decision, and careful and detailed studies were needed.¹⁰⁴

After the end of the World War II a plan was prepared by the Government of Bihar to control the Kosi. The plan was to embank the Kosi "by confining it to a definite channel by building marginal embankments, 16 kilometers or so apart, running parallel to the Nepal foothills to the Ganges", at an estimated cost of Rs. 10 crore.¹⁰⁵ This plan was rejected by the Government of India, which recommended the execution of a high dam across the Kosi at Barahkshetra in Nepal on the lines of the Damodar Valley Project, which was also on the planning board at that time. The Chairman of the newly formed Central Water Irrigation and Navigation Commission (CWINC), A N Kohli, was given the responsibility of preparing the preliminary report of the Barahkshetra dam project in 1946. Renowned authorities on dam construction in the U.S, J.L. Savage, Walter Young and geologist F.H. Nickel were

¹⁰³ Ghosh, pp.120-21.
¹⁰⁴ Ibid., p.120.
¹⁰⁵ Post War Plan of Bihar, 1945, p.85.
consulted before the preliminary reports could be finalised. The proposal was to build a concrete dam of 229 metres height with a storage capacity of 0.31 million cubic metres. It was also to have a hydroelectric generation unit of 1,200 megawatts and a canal system to irrigate 12.5 lakh hectares of land in Nepal and India. The project estimated at Rs.100 crore was expected to be completed in seven different phases in 10 years. It was also argued that the concrete dam would be able to withstand the shock of earthquake and taming of the Kosi with the help of embankments would be disastrous. 106

This dam project was postponed due to rains, scarcity of funds, and need for further investigations. On 5 June 1951 a committee was constituted under the chairmanship of S.C. Mazumdar, advisor engineer, Government of West Bengal. The committee generally approved the Barahkshetra (or Kosi) dam project but noted that a huge block of power would not be utilized for a long time to come and a large capital would be blocked unproductively in the name of power generation. The committee also felt that the benefits of flood control would be available quite late in the plan and it recommended that the proposal for the Barahkshetra dam be dropped. 107

The Mazumdar Committee however came out with an alternative proposal (known as the Belka scheme), which was to include a 19.2 km long earthen dam of 20 meters height to be constructed 14.4 kms downstream of Belka hills with the storage capacity of 2.27 lakh hectare meters. This dam was expected to produce 68 megawatts of power, and irrigate 6.15 lakh hectares in Bihar through the eastern Kosi main canal and the western Kosi canal, at an estimated cost of Rs. 55.5 crore. A 56 Kms long embankment, from Kusaha to Bhagwanpur, was also part of the scheme to prevent the westward displacement of the Kosi. 108

The Government took a go-slow stance on the Belka scheme as well. After the floods of 1953 the Government of India constituted yet another committee comprising of V Krishna Iyer, Chief Engineer, Andhra Pradesh, Kanwar Sain, Vice-Chairman, CPWC, M.P. Mathrani, Chief Engineer, Bihar and N.K. Bose, Director, River Research Institute, Calcutta to suggest some means to control the floods of the Kosi. The final report of this committee was submitted on 13 December 1953 and is normally referred to as the 1953 plan. The salient features of the proposal costing Rs. 37.31 crore were:

1. To construct a barrage 1,150 meters long, five km north of Hanuman Nagar in Nepal at an estimated cost of Rs.13.27 crore.

2. To contain the stream of the Kosi, marginal embankments were proposed on either banks of the river. On the western bank measured 121 kms whereas on the eastern side 99 km long embankments were proposed.... The entire job was estimated to cost Rs. 10.67 crore.

3. To construct the eastern canal system to irrigate 5.67 lakh hectares of land in the district of Saharsa and Purnea at an estimated cost of Rs. 13.37 crore.

An important feature of the scheme was that the embankments were constructed wide apart, about 12 to 16 kilometre, to serve as a silt trap. This obviously was an attempt to postpone the present danger to the future as observed by another exponent of big river projects, Dr. K.L. Rao, former engineer in Central Irrigation and Power Commission and Union Minister for Irrigation and Power. He argued, “the Kosi carries heavy silt and in a few years, it may be that the existing construction may not prove adequate. Further measures such as detention basin (or dams) will have to be taken up besides intensive afforestation in critical areas where erosion is very heavy.”

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109 Report of the Public Accounts Committee, 5th Vidhan Sabha, presented on 8 June 1972, p.52.
Thus, it becomes obvious that after spending over a crore of rupees on investigations and consultations for the Barahkshetra dam project, the embankments, which were given a go by being termed as outdated and obsolete, suddenly became acceptable. The whole debate had come full circle and the river was yet to be 'tamed'. This turnaround was seen not only in the Kosi but also in all the other rivers of North Bihar, which witnessed the embanking of almost all the rivers in the post-Independence era. The obvious reason for the dropping of the Barahkshetra dam project was its cost (the cost had climbed to Rs. 177 crore in 1952), which the Government was not in a position to invest. The Government was also under pressure to do something immediately to control the Kosi, and therefore a cheaper solution was sought. The Mazumdar Committee’s recommendation provided that perfect way out for the Government. It should also be noted here that the same S.C. Mazumdar had a different view earlier. In 1940 he had argued, “...in fact, having regard to our experiences in Bengal, construction of flood embankments as a flood controlling measure would be like mortgaging the future generation to derive some temporary benefit for the present generation.” 111 What brought this change of opinion? Was there some kind of pressure on the Committee to come up with a particular kind of solution? Why did the Kosi become the center of attention in the 1940’s?

As has already been mentioned, the Kosi in its westward movement had started affecting the Darbhanga district from the 1930’s onward; the water of the Kosi had started entering the Tiljuga. The Darbhanga district was a densely populated and intensively cultivated district. The Darbhanga Raj had built a continuous embankment on the west bank of the Tiljuga to safeguard its crops and population. However, this embankment could not give complete protection as every year breaches occurred resulting in floods which damaged the crops and property. So the first serious attempt to control the Kosi during the colonial

period was made by the Darbhanga Raj. It has also been shown in this chapter how the Darbhanga Raj continued to maintain and strengthen the Tiljuga embankment, even in the face of Government opposition and adverse judgements of the Civil Court. How could the Darbhanga Raj think of taking on the might of both, the Kosi as well as the British Government?

The most important reason for the Darbhanga Raj to control the Kosi was threat of vast area of its estate turning into wasteland. The extent of the devastation caused by the Kosi in British India (in 1942) extended on the east up to the Bhagalpur boundary, on the west 5 to 7 miles beyond the Darbhanga district boundary and on the south up to the railway line between Khagaria and Kursela. The approximate area of this tract was 2,700 square miles out of which 1,500 square miles, from where the Kosi had receded, was under reclamati on in the 1930’s. But it could take 10 to 15 years to render this area to the pre-Kosi condition. The remaining 1,200 square miles which before the advent of Kosi was comparatively free from devastation, was in the 1930’s being rapidly converted into wasteland denuded of all cultivation and human habitation.\(^{112}\) It was to save this vast expanse of land that the efforts were being made in the 1940’s to control the Kosi. The same reason had also prompted the construction of the Tiljuga embankments.

The Darbhanga Raj had the resources, being one of the two biggest zamindari estates in Bengal (the other being Cooch Behar), to confront the Kosi. It could afford to invest heavily year after year on constructing and maintaining embankments of the size that could control the Tiljuga. This is evident from the fact that while the Banaili embankment on the eastern bank of the Tiljuga crumbled down by 1940 due to the yearly havoc wrought by the Kosi spill, the Darbhanga Raj embankment on the western bank on the contrary was

\(^{112}\) Ghosh, p. 118.
in fair condition. The Darbhanga Raj could obviously afford to invest heavily on its annual maintenance.

It was not just the resources at the command of the Darbhanga Raj, but also the influence of the Maharaja of Darbhanga on the colonial government which is crucial. This is evident from the fact that in the flood season of 1945 the Viceroy, Lord Wavell, visited the Kosi area on the invitation of the Maharaja of Darbhanga, Sir Kameshwar Singh, to have a feel of the floods there. It was after this visit that the Central Water Irrigation and Navigation Commission was given the responsibility of preparing a preliminary report of the Barahkshetra dam project in 1946.\textsuperscript{113}

Before the Kosi started to affect the Darbhanga District it had already created havoc in the Purnea and Bhagalpur districts. But the latter two districts, especially Purnea, being sparsely populated (the eastern part of the Bhagalpur district was also densely populated and intensively cultivated), no attention was paid to prepare any project for the controlling the Kosi. But once it started affecting the Darbhanga district all attention was drawn towards the Kosi, first by the powerful and influential Darbhanga Raj, then by the colonial government, and finally, by the post-Independent government.

People's expectations had also increased because of the wide media coverage from 1946 to 1951 on the Barahkshetra dam project. A conference of the Kosi sufferers was organized in Nirmali, near Supaul in Bhagalpur district, on 6 April 1947. It was attended by C.H. Bhabha, member of Ministry of Mines and Power, Sri Krishna Sinha, Chief Minister of Bihar and Dr. Rajendra Prasad. In this conference the details of the dam project were discussed and all the leaders had assured the people that their sufferings were going to end.

\textsuperscript{113} D.K. Mishra, \textit{op. cit.}, p.2210.
People’s expectations increased further after Nehru twice made aerial survey of North Bihar during this period.\textsuperscript{114}

So the pressure on the Mazumdar Committee to come up with a solution to the Kosi floods was, first from the vested interests (of the Darbhanga Raj and the people) and, second from the Government itself, which needed a face saving formula after the dam project had been shelved. Thus, we see a complete turnaround in the embankment debate. For the complex turn of events embankment again gained an acceptability that it had lost in the 1930’s and 1940’s. Dam as an option to control floods was available, but it was an expensive one. Also, the post-Independent democratic Government could not, unlike the colonial government, completely ignore the vested interests of several sections. Although the colonial government had passed on the wisdom that they had gained while dealing with floods, they had also passed on the colonial legacy. The various forces of change colonialism stimulated in the Indian countryside, the new class of people, empowered zamindars, railways, roadways, fetish and fascination for ‘control’, all had by now taken much more mature shape. It was an inheritance that the Indian government had to live with and deal with in the decades to come in its search for a ‘new India’.\footnote{Ibid.}