

**PROCEEDINGS**  
OF THE  
**PATNA FLOOD CONFERENCE**

HELD ON

*The 10th to 12th November, 1937*

IN THE

**SINHA LIBRARY HALL,**

**PATNA.**



SUPERINTENDENT, GOVERNMENT PRINTING,  
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**Proceedings of the Patna Flood Conference held on the 10th to 12th  
November 1937 in the Sinha Library Hall, Patna.**

*November 10th, 1937.*

His Excellency the Governor of Bihar delivered the following address:—

GENTLEMEN,

I offer you all a most cordial welcome and I thank you for sparing time to come to Patna to discuss with my Government and their advisers the very difficult problem of floods. The problem of floods in Bihar is not a problem of which I can claim to have much personal experience. I have not served in districts liable to recurrent floods, while during the periods that I have been in districts liable to occasional floods, those districts have fortunately been immune from any major disaster. I have tried during the last few months to make myself acquainted with the facts, but I admit I do not yet see clearly any radical solution of the problem. But I have no doubt that the discussions which you will have at this Conference will throw much light on the problem and will prove invaluable to Government in deciding the line which they will take in dealing with it.

2. In dealing with this problem we are up against nature and nature in one of its most devastating and dangerous activities. The earthquake of 1934 did a vast amount of damage in a few moments of time, but the damage caused by that disaster was probably not greater than the cumulative damage caused by recurrent floods in the Ganges valley. During this year we may congratulate ourselves on having escaped a major or widespread flood, in particular in the Tirhut and Patna divisions, in fact at one time I was apprehensive that the countryside would suffer more from drought than floods, but fortunately that apprehension has not been realised. We have however had floods in that extremely difficult area in North Bhagalpur through which the Kosi river flows and Government had to spend large sums on charitable relief and on loans. I should like to take this opportunity of paying a tribute to the sterling work done by Government officers and voluntary workers in the neighbourhood of Supaul and Madhipura for mitigating the distress. In particular I would thank the officers in charge of these two subdivisions for all that they have done.

3. At this stage there is one observation which I must make. Though as I have said floods have on the whole not been so severe as in some recent years, yet if one believed all that appears in the Press, one would certainly gather the impression that there had been numerous severe and disastrous floods. Floods are good news value and newspapers both in this and other countries are I think inclined to give unduly harrowing description of floods and to exaggerate the damage that has been caused. They no doubt receive the accounts from local correspondents who are anxious to secure the maximum amount of assistance for the area in which they live. I also recognise of course that at first sight to see a large area formerly covered with good crops entirely submerged and under some depth of water is a terrible sight which cannot but excite one's pity and compassion. But I would ask all connected with the Press or who send accounts of floods to the Press not to exaggerate the damage. I may perhaps give a small example which I noticed a short time ago of such exaggeration. I read one account to the effect that several bridges and culverts on a certain line of railway had been destroyed or seriously damaged which seemed to justify the inference that a very severe flood had occurred. Next day I read what was the correct account which was that one bridge had been regarded as temporarily unsafe and traffic was diverted for a day or possibly only half a day till it was repaired. Exaggerated statements can do no good; they can only cause unnecessary panic and alarm. Though I do not wish to appear to minimize the damage caused by floods, I would ask

all connected with the Press not to over-estimate the damage. In an area attacked by a flood, the responsible Government officers are bound to collect accurate information as soon as possible and they will always be ready to communicate such information to the Press.

4. In estimating the damage caused by floods, the fact must not be lost sight of that short-lived floods when the water stays on the fields for only a short period, especially if they occur at the early part of the cultivation season, do not cause much damage, in fact at times they do more good than harm. I would invite your attention to some significant figures which I have recently seen in a pamphlet on floods in Bengal. Engineering records over the long period of 62 years show that of floods 22 per cent are subnormal, 55 per cent are normal, 21 per cent abnormal and only 2 per cent extremely abnormal. In other words the dwellers in this area can expect to be flooded rather badly once every five years on the average and to have a really dreadful flood once every fifty years or so. Again I wish to make it clear that I do not wish to minimize floods, but these figures do I think support the view that floods are not as bad as would appear from some of the accounts which are given of them.

5. But clearly even a rather severe flood once in five years is a disaster from which the poor cultivator with his limited resources must be protected, if it can possibly be done. That is the problem which we are here to discuss. Put in simple language, the problem in the Ganges valley seems to be "bandhs or no bandhs", "embankments or no embankments". You have been given, I believe, a certain amount of literature on the subject and the expert advisers of my Government can give you plenty of information. In this respect Bihar does not differ from other areas liable to flood; there is the same problem in Bengal, the same problem in our sister province of Orissa. There is the same problem in China, the same problem in America, in particular in the Mississippi valley, where in spite of vast expenditure, in spite of the most expert engineering skill, the embankments, or levees as they are there called, put up to keep the river under control, do not appear to have proved a success. I will not put it more strongly than that.

6. I must confess that though I keep an open mind on the subject, my present view is that "bandhs" do more harm than good. It is only natural that the owner of a piece of land, looking at the matter from his own individual viewpoint should try to construct something that will keep out the flood. But I and my Government cannot take into account merely the interest of a particular individual; we have to try and secure the "greatest happiness of the greatest number" and we must see that what is done by one individual to protect his private interests does not affect others. I may quote an example based on my own experience of what may happen if a protective embankment is constructed. Some years ago after a disastrous flood in the Sone river, Government arranged for the construction of an embankment in Shahabad district to protect the threatened part of that district and in particular Arrah town. Shortly after that I was District Officer of Gaya and I had many protests from residents in that district contending that this embankment on the west bank of the Sone would throw the river when in flood across into Gaya on the east bank. Actually I do not think it has had this result, but I felt that the apprehensions expressed by my Gaya people were not without foundation. More recently since I came here as Governor I saw a proposal to protect Saran district from floods by an embankment to keep out the Ghoghra river. My previous experience at once occurred to me and I suggested to my then Ministry that we must see what view the Government of the United Provinces had on the subject as they were responsible for the land on the west bank of that river. I was not surprised when I saw their reply that this might devastate large areas in Ballia district. This incidentally necessitates the necessity for close co-operation between all provinces—a point to which I shall refer later.

7. But though this is one of the objections to embankments that it may merely transfer the evil from one area to another, there are other more

serious objections. I will state these as they appear to me in simple language and I trust my expert advisers will agree with what I say. The most serious objection is that if water finds its natural level and its natural flow off, it flows off quickly and as I suggested earlier in this speech if flood water flows off quickly, it does less damage, considerably less damage than if it takes many days before it disappears. The second is a more technical point. The Bihar rivers, the tributaries of the Ganges, coming as they do from the Himalayas or the foothills of the Himalayas, flow generally in a southerly direction; they bring down a large amount of silt and if not interfered with by embankments would gradually deposit the silt all over the Ganges valley and thereby raise the general level. You might have floods, but not abnormal floods, and no serious damage would be caused or rather such damage as would be caused would be extensive not intensive and as far as I can see if the damage is extensive, it is far slighter than if it is intensive. But there is another difficulty caused by embankments. An embankment may result or rather I would say must result in the level of the ground on the upstream side of the *bandh* being raised, for that area gets the deposit of silt. The embankment may for some time protect the land-owners on the downstream side, but ultimately if the embankment breaks, and I gather that neither we nor even the Americans in the Mississippi valley can build unbreakable *bandhs*, the damage done to the downstream side of the lands is far greater than it would otherwise have been, while in addition to this there is the recurrent damage to all land on the upstream side of the *bandh*. This seems to me to be in words of one syllable one of the dangers resulting from an embankment.

8. I have devoted myself so far to trying to show that embankments tend to intensify rather than minimise floods. It will be for this Conference to say whether they accept this general principle. But once you lay down a general principle you find that it is necessary to modify it in particular cases, each case must be considered on its merits and if a detailed examination of individual cases is made, it may well be found that in certain cases embankments are necessary. It is in my view necessary to have embankments to protect densely populated areas, towns or large villages. I have alluded to the embankment which was constructed to protect Arrah town; Chapra is another town liable to attack by flood, while we have during this year taken steps to protect Begusarai by reconstructing the Gupta *bandh*. Some experts also hold that embankments are necessary to prevent two rivers joining up. Thus Colonel Temple who is well acquainted with Tirhut suggests that the Bagmati, until it has finished its land building across the middle of Muzaffarpur district, should be persuaded to keep out of the Burh Gandak and that will best be done by maintaining an embankment on the divide between the valleys of Bagmati and the Burh Gandak. There is also the very difficult problem of that extraordinary river the Kosi which during the last hundred years has moved hundred miles and now threatens to join up with the Tiljuga.

9. Another question which of course arises is the question of roads and railways, whether they have sufficient waterways. Often railways are blamed for causing obstruction to the flow of water but it has been stated by one authority "that the large road and railway banks across the flood plains have but little effect in increasing the damage caused by normal floods and in abnormal floods the damage they do upstream is compensated by the damage they save on the downstream side. In extremely abnormal floods they are so damaged themselves that they do not affect the amount of damage done to the countryside at all." Fortunately we have here to-day two officers of the Bengal and North-Western Railway who are well acquainted with the problem and whose advice based on long experience will be most valuable.

10. Then having considered the problem of embankments, we have to consider what alternative measures are possible. In America I believe they attempt to divert flood water from inhabited or cultivated areas to areas where there is little or no cultivation. It appears very doubtful whether

any such solution is feasible in Bihar where every foot of the ground is cultivated. It may be possible in some cases to cut a channel from a river but whether a river such as the Kosi could ever be persuaded to follow a particular channel seems to be a little doubtful. I mention these possibilities merely to show the difficulty of the problem; it may be helpful to us to get knowledge of what is being done in other countries and that is a suggestion which I know my Government are considering.

11. I have alluded above to the necessity for co-operation in dealing with this problem of floods. I am afraid that there has been a tendency in the past to deal with individual areas which are liable to or have suffered from floods as separate isolated problems, to see what can be done to protect that particular area rather regardless of its effect on other areas. An example of this can be found in the proposal which I have referred to of putting an embankment in Chapra district, which as far as I could see failed to take into account the effect that such an embankment would have on adjacent district of Ballia. Most of the rivers, the tributaries of the Ganges which are the cause of floods in North Bihar, have their sources outside the province, some draw their water from the Himalayas. It may be possible,—I do not wish to put forward this suggestion with any degree of certainty,—to take action in the higher reaches of these rivers which will mitigate floods in the lower reaches. In any case it is clearly desirable that all the Governments concerned should consider the problem. I know that the Government of the United Provinces is willing and ready to co-operate and such co-operation, apart from being useful in dealing with the problem of a particular river, will also be helpful in that the experience gained by one province will be available to another province. Pooling of experience is always useful. I hope too that the Government of Nepal will be ready and willing to help us for it is in that country that rivers such as the Kosi have their sources. But apart from co-operation between Governments, there must also be the closest co-operation between the various departments of Government. It has not infrequently happened in the past that a District Board has raised the level of a road and thereby prevented the flow-off of flood water and I have seen cases in which it has been proposed that District Board should be asked or directed to reduce the level of the road and make some waterways.

12. Thus it is clearly necessary to have in the flood affected area some statutory authority which will deal with these problems. There is an old Act in force. I cannot claim to have any practical experience of its working, but it may well be that that Act needs amendment and revision. I hope you will have time to consider in outline if not in detail what form that amendment should take. It is very possibly desirable to have a statutory Committee for the whole area north of the Ganges in this province consisting partly of experts and partly of non-experts which will advise Government on these problems. If a similar Committee is established in the United Provinces, the two Committees will, I feel sure, be able to make some improvement.

13. I have referred to the fact that in fighting floods we are fighting nature, but that statement is only half of the problem. In dealing with it and in particular in dealing with the question of embankments we are up against "vested interests" and I am sure you will all agree with me when I say that if you attack "vested interests", you may expect a vigorous protest from these interests. I admit it is not desirable to ride rough shod over "vested interests", but if a vested interest conflicts with the very essential principle of securing "the greatest happiness of the greatest number", then we must deal with the "vested interest".

14. I must apologise for the fact that much of this speech is destructive rather than constructive. I have emphasised, possibly over-emphasised, the difficulties of the problem, but I have done so deliberately, for I wish these difficulties to be fully recognised; I wish it also to be recognised that in this contest with nature, in one of its most devastating aspects, in the contest with vested interests created by human agency, we cannot expect rapid progress. "Rome was not built in a day" and certainly the Ganges valley

was not built up in a day. We cannot hope to decide the problem of Tirhut floods at the Conference; we can suggest lines of approach to the problem; but we and our expert advisers must collect a mass of information,—a volume of statistical information,—before my Government can decide what action is most suitable. We may suggest palliatives. We may undertake a publicity campaign to tell the villagers where habitations are exposed to floods the most suitable way in which to construct their houses, but if we expect a final solution of the flood problem of North Bihar in a few years we are doomed to disappointment.

15. But I do feel that the more we discuss the problem, the nearer we get to a solution of the problem and with that hope at the back of my mind, I ask this Conference to start its deliberations.

*The Hon'ble Mr. Anugrah Narayan Sinha* :—Your Excellency and gentlemen,

You will find from the agenda that Babu Rajendra Prasad was to address you after His Excellency had concluded his address; but I have just received a letter from him which I want to read to you :

He says :—

SADAKAT ASHRAM, PATNA :

*Dated the 10th November 1937.*

My dear Anugrah Babu,

I regret very much that my health does not permit me to attend the Flood Conference which has been convened by the Government and is going to be opened by His Excellency the Governor to-day. My regret is all the greater because I have been looking forward to taking part in it as I have felt that it is going to deal one of the most pressing problems of the Province. I hope that experts and laymen assembled in the Conference will be able to devise ways and means for meeting the flood menace which has become an annual affair in our Province. I have, however, put down a few stray thoughts on the situation which I am sending to you for such use as you and the Conference may consider fit.

Yours sincerely,

RAJENDRA PRASAD.

To

Hon'ble Babu Anugrah Narayan Sinha,

Finance Minister, Patna.

*The Hon'ble Mr. Anugrah Narayan Sinha* :—I am sure gentlemen would like his address to be read out, which I therefore place before the conference.

“Floods have been devastating large tracts in the Province year after year and, if popular belief is correct, their fury and duration have increased greatly after the great earthquake of 1934. It is therefore a matter for congratulation that this Conference has been convened for devising ways and means for meeting the menace of floods. North Bihar and South Bihar, that is, Bihar north and south of the Ganges, present somewhat different problems the solution for which is bound to be different. In North Bihar we have a series of rivers rising in the Himalayas or their outskirts and flowing in southern or south-easterly direction till they fall into the Ganges or one of its tributaries. The rivers in South Bihar have their sources in the hills of Chota Nagpur and take a course either towards the north or north-east till they join the Ganges or towards the east and fall into the sea. North Bihar is generally green and moist and fertile. South Bihar is dry and fertile but in some places there is insufficient moisture in the soil which does not yield good crop and requires irrigation. But the rivers both in North Bihar and South Bihar are liable to floods and heavy rains in the hills are often their cause. The problem of North Bihar is two-fold—how to prevent heavy rains yielding



immense quantities of water from becoming the agency of devastation and destruction that they so often are and to convert them into crop-yielding fertilisers and secondly, how to deal with water-logged areas which become devastated by malaria. In South Bihar also the problem presents two-fold aspects, viz., prevention of floods and utilisation of surplus water for irrigation purposes.

It should be borne in mind that while the problem is capable of being tackled to a considerable extent in this Province alone it cannot be tackled in its entirety as some of the larger rivers flow from or into other Provinces also. In North Bihar there is the Gogra which comes from the United Provinces and there is a small river Chhoti Gandak which also comes from the United Provinces. But the other rivers are all confined to Bihar except that most of them rise in the Himalayas outside British India. In South Bihar most of the rivers rise in the Chota Nagpur Hills except the Sone which has its source in the Amarkantak in the Central India and the Damodar passes out of the Province and flows through Bengal. The Ganges of course cuts right through the middle of the Province covering practically its whole length from west to east having already covered several hundred miles in the United Provinces and similarly covering several hundred miles in Bengal. Therefore so far as the rivers which flow through several Provinces are concerned any scheme must necessarily take into account the conditions of those Provinces also. The additional difficulty with the North Bihar rivers is that many of them enter Bihar at the foot of the Himalayas at points at which it is difficult to control them. Their previous course lies through Nepal territory. It would therefore be necessary in case of such rivers, if anything is proposed to be done for them, to have negotiations with the Nepal Government. These are some of the political and semi-political considerations which have to be borne in mind.

The rivers which flow through North Bihar are the Gogra, the Chhoti Gandak, the Gandak, the Sikrahna or the Burhi Gandak, the Bagmati, the Lakhandai, the Kamla, the Jiwachh, the Balan, the Tiryuga and the Kosi besides a number of smaller rivulets such as the Harha, the Masan, the Pandai in Champaran. The difficulty with these rivers is that they suddenly rise with heavy rains in the hills and may cause devastation even when there is no local rain in the areas through which they pass. But it also happens that there is heavy simultaneous rain in the hills and in the plains and then the devastation is correspondingly greater. They pass through sandy soil which is not able to resist the force of the current and they easily cut through new areas. Sometimes it so happens that a small obstruction in their ordinary course becomes a sufficient pretext for their cutting out an altogether new channel. Through all this area there is not a single inch of high ground or rocky soil in the districts of Saran, Champaran, Muzaffarpur, Darbhanga, North Monghyr, North Bhagalpur and Purnea. It is notorious that the Kosi changes its course frequently and travels as it were nearly 50 or 60 miles from the easternmost point of Purnea right up to Supaul in Bhagalpur district in 50 to 60 years. As it moves along it leaves numerous channels behind and while it fertilises one tract it devastates another, repeating this in 50 or 60 years for the whole area that falls within its course. At the present moment its attack is in the North Bhagalpur District where not only large tracts are rendered unfit for cultivation but also subjected to severe malaria. Similarly the Bagmati is also known to change its course and while parts become extremely fertile on account of the silt other parts becomes subject to worst type of malaria as was the case only two years ago in and near about Rampurhari only a few miles north of Muzaffarpur. The Gandak is considerably controlled by the Public Works embankment on both its banks practically right through its course from a point in Champaran where it emerges out of the hills right down to Sonepur opposite Patna where it falls into the Ganges. The embankments have served to keep it confined within themselves. There is a series of what are called *muns* or lakes in the district of Champaran which may at one time have been within the course of this or any other river but are now deserted by the rivers and left as it

were to serve as a memento of their having been once in the bed of the river. It is also possible that these lakes may sometime in the past have been caused by a severe earthquake which altered the level to such an extent as to cause depression in these places and lift up the level around them. I do not know if the theory can be justified by reference to any recorded facts but it seems not impossible in view of the alteration in levels caused by the earthquake of 1934. The problem therefore which has to be investigated resolves itself as follows :—

1. What if any is the effect of the earthquake in altering the levels of the countryside and the levels of river beds ?

2. Are any materials available which may enable a scientific theory to be built up about the behaviour of the various rivers concerned ?

3. Is it possible to so control them as to make them efficient for draining away the surplus water without causing devastation ?

4. Is it possible to create artificial reservoirs where the surplus water may be stored and let off for irrigation purpose when required ?

What would be the cost of such scheme ?

It seems to a layman that the earthquake must have affected the levels both of the countryside and the river beds. The survey which the Government ordered in 1934 did not give any conclusive result for various reasons, one of them being that even the bench marks which could serve as the starting point could not be regarded as entirely reliable standard because they themselves might have suffered depression or elevation. But even as it was the survey indicated that in some places there was a difference in the level from one to two feet within a few miles which is considerable in view of the flatness of the country. It was noted after the earthquake that most water reservoirs like wells, tanks, river beds, water channels were filled up to a greater or lesser extent with sand thrown up by the earthquake. In some cases big ditches and tanks were completely filled up making them almost untraceable and unrecognisable. The bed of the Lakhandai river was filled up almost to the brim at one point which I saw. It therefore stands to reason that in cases of the larger rivers also like the Gogra and the Gandak the river bed was filled up and therefore these rivers have very much reduced capacity now for carrying water. This theory finds support in the fact that even when the flood in the rivers is not as heavy as before the spill water spreads over a much larger area and stays there for a much longer period than it used to do before. It appears that the carrying capacity of the rivers being considerably reduced they are unable to drain away as much water and as quickly as they used to do before with the result that in the district of Saran particularly heavy floods devastated a great area covering practically the entire length of the district some miles broad along the Gogra. In the district of Champaran the area beginning at a point a few miles north-west of Motihari and going south-east right up to the borders of Muzaffarpur was badly hit. This is the basin of the Sikrahna river which also seems to have reduced carrying capacity. In the Muzaffarpur district the area between Sitamarhi and Muzaffarpur suffered similarly and was much damaged on account of floods. This is the area which may be said to be the basin of the Bagmati and the Lakhandai. Then further east there is a big strip of land in Darbhanga district which suffered immensely in 1936 and has suffered again in 1937 on account of the behaviour of the Kamla and the Jivach. North Monghyr from Mansi upwards presents during the rainy season the appearance of a vast lake. I believe there are more rivers and bridges between Mansi and Saharsa than there are perhaps anywhere else in the province within the same short distance. Mansi to Naugachia presents the appearance of another big lake and then we get into the Kosi area which has been already referred to. If something could be done to drain and regulate these rivers the whole of the area

would easily become one of the most fertile tracts in the country. Even as it is, whatever land is immune from the devastation of floods yields very large harvest. The problem, complicated as it was, has become more complicated on account of the earthquake and it is therefore suggested that it should be carefully studied in a scientific way and such material as may be available in the records of the Government and as may have been collected by the special branch of the Irrigation Department which has been working in these parts for some years should be scrutinised.

Apart from the problem of the rivers there is the other problem of large tracts remaining covered with water. For many months in the year these become unfit for cultivation and breed malaria. In the district of Saran we have the big *Hardia chaur*; in Muzaffarpur there used to be the *Bharthua chaur* and the area near about Sanathi and Rampurhari and in Minapur thana. There is the area in Majorganj thana which has attracted attention this year on account of the devastation of malaria. It is not necessary here to mention all these and I have just given a few by way of illustration. It seems to me that all these could be drained at a comparatively small cost and rendered fit for cultivation and free from malaria.

The problem of floods, irrigation and malaria is one combined problem which needs one comprehensive solution. But the solution requires a scientific investigation for which I doubt if sufficient materials are available. It has been suggested in relation to Bengal that the districts of Hooghly, Burdwan and parts of Bankura and Birbhoom which once used to be the most fertile and the most healthy parts of the Province have become malarious and less fertile on account of the bad handling of the rivers that used to flood the area and deposit fertilising silt and wash away malaria larvæ. Doctor Bentley, the Director of Public Health of Bengal and Sir William Willocks, a distinguished engineer, have both pleaded passionately for a reasonable treatment of these channels. I apprehend that unless reasonable treatment is given to the rivers of North Bihar some of the most fertile and smiling tracts may be reduced to malarial swamps.

It is not for a layman like me to suggest what is possible from an engineering point of view but I feel strongly that it should not be beyond the resources of engineering science to deal with the problem successfully. One common solution which has been attempted from time to time without perhaps sufficient scientific investigation has been the erection of *bandhs* and embankments at various places. As I have already mentioned the biggest example is the Gandak embankment. It must be admitted that it has successfully protected the areas outside the enclosed bed but it is possible that the river bed has been rising and a time may come when it will be at a higher level than the country on both sides of the river and the embankment will have to be constantly raised in its height. When such a point is reached if it has not reached already then any breach in the embankment at any point is bound to create the greatest havoc and the river may in that case change its course altogether. Within the last fifteen years or so, it has been seen that the embankment along the Ganges and on the southern side of Patna to protect it from the floods of the Poonpoo has been raised several times. Whether it has become necessary on account of a rise in the bed of the Ganges or not it shows what will have to be done in case the river bed rises. Therefore it will be a matter for consideration whether embankments to serve as fences will ultimately be the most successful plan. I understand that the Tirjuga embankment has given way and the protection expected of it has disappeared. But apart from the embankments and the *bandhs* constructed for confining rivers there are many smaller *bandhs*, private, semi-private and public which have been erected for protection of particular areas. Then we have the biggest embankment constructed by the Railway crossing and re-crossing the Province east to west and north to south practically throughout its whole length and breadth. We have numerous District and Local Board roads serving as embankments between one area and another throughout the Province. When private embankments are considered responsible for fury of floods in some parts we dare not ignore the effect of the biggest

embankments in the shape of these rail-roads and District Board roads. I have noticed that while the water on one side of a railway line is several feet deep on the other side there is hardly any water at all. A journey through the flooded districts in a railway train on the Bengal and North-Western Railway in North Bihar gives peculiar experience. I have travelled in a train which waded through water slowly. No wonder that almost every year there are breaches but what surprises one is that the breaches are simply filled up as soon as the flood passes away and it is only rarely that they are converted into culverts or bridges for allowing the flood water to pass through. Between Sonapore and Chapra there have been dozens of breaches every time that there has been a severe flood and traffic has been dislocated for weeks together yet the Railway for some reason or other has not constructed bridges at these points. So when embankments are held responsible for floods and a suggestion is made that they should be done away with, the embankments which ought to attract attention first of all are the railway embankments and District Board roads. This of course would be a counsel of despair and I am not without hopes that engineering skill should be able to devise other methods to deal with the situation.

Construction of bridges at wrong points was also responsible for much havoc. I am told that the Hardinge Bridge at Sara in Bengal has been causing anxiety to the railway authorities. On a smaller scale the Gogra bridge near Manjhi in the district of Saran appears even to a layman to be responsible for the damage done to the prosperous village or groups of villages of Shitabdiara. The bridges in the Sitamarhi-Muzaffarpur road have had very often to be changed from their locations to accommodate the Bagmati and it may be that their wrong location is responsible for much of the damages of that area. Therefore in making any plan for bridging rivers or roads the behaviours of the rivers, the nature of the soil and other factors must be carefully considered.

It is not possible for me to give a plan or a scheme for dealing with the problem. I have attempted to place before the Conference certain facts which have struck me as I have wandered year after year through one tract or another in connection with flood relief since 1911. It seems to me that the problem should be tackled in a comprehensive way. Nothing should be left to chance so far as it is scientifically possible to deal with it. Where sufficient data are not available they should be obtained before any conclusions are arrived at. Any comprehensive scheme is bound to be expensive but I believe if economically managed and carefully planned it should not prove beyond the resources of the Province. It would be possible to raise a public loan for this purpose. But while the big scheme is in preparation there may be smaller schemes giving immediate relief to particular localities. These may be taken in hand without any delay, unless of course it is apprehended that any of them is likely to interfere with a larger scheme in contemplation. Wherever necessary the other Provinces concerned should be consulted and taken into confidence and if it is found that no comprehensive scheme is possible without their co-operation immediate steps should be taken to enlist their sympathy and co-operation. The Conference has met at a date not too soon and I pray that its labours may be rewarded."

*His Excellency the Governor* :—I am sure the whole conference is grateful to Babu Rajendra Prashad for his views and they extremely regret that due to his ill health Babu Rajendra Prashad could not attend the conference. I am sure they will ask the Hon'ble Minister to convey to Babu Rajendra Prashad their gratitude for the address which he has sent down to us and which has been read out in the conference. I am sure they will be most helpful to you in course of your deliberation.

*The Hon'ble Mr. Anugrah Narayan Sinha* :—Gentlemen, you will find from the agenda that I was to address you after Babu Rajendra Prashad but I think it would not be useful at this stage to make any speech. His Excellency has already placed before you the views of Government and Babu Rajendra Prashad has very carefully and thoroughly discussed the problem. If necessary at all I shall take advantage of the deliberations which will take place

within the next two or three days and at the end I shall try to sum up the proceedings and in that connection I will make my submission to you. At the present moment Mr. Dip Narayan Sinha will address the conference.

*Mr. Dip Narayan Sinha* pointed out that North Bihar depends to a great extent on the *agahani* crop and that 85 per cent of its population depends on agriculture for its living. With a population density of over 800 per sq. mile an individual has to depend on the yield of about 2 bighas of land which often fails to yield any crops due to flood or drought.

Although this Conference was summoned purely to discuss floods Mr. Dip Narayan Sinha considered it should discuss the reconstruction and re-development of North Bihar; he admitted, however, that flood was the foremost problem, and observed that they should not be prevented but should be divested of their mischievous character and made useful which could be done by allowing them easy and regulated run off; but through ignorance the people have erected obstructions, District Boards have constructed roads and the Railway embankments with insufficient waterways with the result that the damage done by floods is accentuated.

Captain Hall would like people to become "anti-bandh", but this was going from one extreme to the other and as His Excellency remarked "each case should be considered on its own merits". He advocated preliminary collection of data to be followed by resectioning existing waterways, opening up channels and the judicious removal of embankments.

He suggested that —

- (1) Railways and District Boards should provide sufficient waterways in their embankments and roads,
- (2) no railway embankments or roads should be constructed or raised without Government sanction,
- (3) all embankments should be provided with waterways,
- (4) the people should not construct new embankments or raise existing ones without the Collector's sanction,
- (5) that boat owners should be organized in co-operative societies.

The problem of draining chauras should also be tackled, and by allowing silt charged water to flow through them the beds would soon rise and besides yielding a good harvest such areas would become free from malaria. Mr. Dip Narayan Sinha quoted an instance of a breach in a bandh resulting in the Ganges silting up and fertilizing a large tract of land.

He advocated the constitution of a special division to deal with these problems, observed that their solution would cost crores of rupees but the Hon'ble Finance Minister had become an expert in finding hoards of money! Long-term loans should be raised, Government guaranteeing the interest, and the capital being recovered from the persons benefited. If Government were up and doing their efforts would be crowned with success.

#### "THE EFFECT OF BANDHS."

*Captain G. F. Hall* :—It was my original intention to speak about the "Evil effect of bandhs" but just before the agenda of this Conference went to the press I deleted the word "evil" as superfluous as I hope to convince you with my following remarks:—

My connection with bandhs in North Bihar has been a long, though intermittent, one. Starting as a junior officer in charge of Government embankments I naturally formed the early conclusion that flood prevention was necessary for the welfare of the country and that bandhs were the means of procuring it. Though there are innumerable private bandhs in North Bihar there are also several which were constructed by local bodies and by Government and so they carried an odour of official sanctity.

As time went on and I became senior enough to make independent investigations or to serve on flood committees, I felt it incumbent on me to know

more about the particular problem under discussion than anyone else and I not only carefully studied all available records but also spent considerable time in the field before attending or presiding at a meeting.

As my knowledge of flood conditions increased, I began to doubt the efficacy of bandhs and gradually came to the conclusion that not only was flood prevention undesirable but that bandhs were the primary cause of excessive flooding; and I think that the majority of people now agree that provided they are evenly distributed and of moderate depth, North Bihar needs floods and not flood prevention, notwithstanding numerous articles in the Press to the effect that Government must take steps to prevent floods.

When I was firmly convinced that this was the correct solution of the flood problem I discussed my views with other local officers and was pleased to find that the majority, though laymen, agreed with my views, as also did several private individuals; and for the past five years I have taken every opportunity of preaching the abolition of bandhs, especially on learning that other engineers had already come to the same conclusion.

Now as regards the effect of bandhs in an alluvial country like North Bihar. The Himalayas are, geologically speaking, very young and at the time of their upheaval what is now the Indo-Ganges valley was an arm of the sea. Following the formation of these mountains, melting snow and rain washed and is continually washing, solid material from their slopes and, as rapid hill torrents lose their velocity as they enter the plains, they deposit the solid matter they carry in suspension. The arm of the sea gradually filled up and in course of time has been forced back to where the Ganges delta is now situated. In this process land gradually appeared above the water and as it continued to rise and became free of salt it became fertile and cultivation began.

But melting snow and rain are of annual occurrence and in alluvial country rivers constantly overflow their banks, deposit their suspended silt and build up the land, a process that maintains its fertility.

If the course of nature had been left alone we should not now be hearing of disastrous floods, washed out villages, damaged crops and starving inhabitants. Our annual floods would be evenly distributed, would run off freely and only on very rare and exceptional occasions would any disaster ensue.

Mr. Salberg in his little booklet "Plain facts about floods in Bengal and Assam" of which some of you have received a copy, has described more aptly than I can how man's interference started and developed and how the situation grew progressively worse owing to the power of Government and the skill of engineers and how substantial bandhs have sprung up everywhere with the complication of embanked roads and railways.

Bandhs may be divided into 3 classes; ring bandhs, ordinary bandhs and marginal bandhs, all of which have upset the natural level of the country and have interfered with the even distribution and free flow of flood water.

Until it breaches a ring bandh excludes flood water from the area it encircles. The water outside continues its land building activities by depositing silt. In course of time the area within the bandh becomes a pit and during the rains remain full of stagnant water as was the case not long ago at Madhipura. So apart from being responsible for excessive flooding as will be shown later, bandhs are also inducive to malaria and ill-health. As the land outside rises, floods become relatively higher and the bandh is raised and strengthened to meet the changed conditions until it can be raised and strengthened no longer. It then bursts and the area it was intended to protect meets with disaster.

Much the same applies to ordinary bandhs. The land on the upstream side is raised while the land on the downstream side is deprived of the benefit of land building material. The difference in level upstream and downstream eventually reaches the stage when the bandh can no longer be maintained intact. The inevitable breach occurs and the area it was intended to protect meets with disaster such as submerged villages and washed out

crops which would never have occurred had the bandh never been constructed. As bandhs head up water it follows that the area upstream is submerged to an unnatural extent, frequently rendering cultivation precarious or impossible. A bandh therefore cannot bring even temporary advantage to some without detriment to others and it is generally the rich man or community who obtains temporary benefit at the expense of his poorer neighbour.

Marginal bandhs along the banks of rivers prevent flood water spilling over the country and so retard land building. Worse still, they cause the land building material to be deposited in the river bed which consequently rises rapidly while the land outside the bandhs remains stationary. Again the time comes when the maintenance of the bandh is beyond human ability; the river, whose level has risen above the level of the country, bursts its marginal bandhs and disaster is inevitable.

I take this opportunity of eating my own words. Some months ago I recorded a note to the effect "that the only justification for bandhs is along both banks of a river having no tributaries". I have studied the problem more deeply since I made that remark which I herewith withdraw. I no longer consider there is any justification for such bandhs.

I might have come to these conclusions regarding the effect of bandhs much earlier had I read the Orissa Flood Committee's Report of 1928. Though I was aware that its recommendations boiled down to 'Remove all bandhs', never having been to Orissa I was not particularly interested and only read this report a fortnight ago to compare its conclusions with my own ideas.

This report was compiled by the Chief Engineer, Bengal, the Chief Engineer, Bihar and Orissa and the Consulting Engineer to the Government of India, all of whom had considerable experience and who spent several months on the investigation of Orissa's problem both in the dry and the flood seasons and I will quote a few extracts from their summary of conclusions in support of my own contentions, as the position is almost identical with that in North Bihar. (In comparing North Bihar with Orissa we can regard the present river—the Ganges—as the sea).

"It must be clearly grasped that there must be flooding, it is Nature's method of land formation, and any efforts to prevent it are doomed to failure from the outset. It might, for example, be suggested that every river should be embanked on both sides from the point where it leaves the hills to the sea; the results would merely be that it would deposit silt in its bed, the bed would rise, the floods would rise and the embankments have to be raised to correspond, until eventually these embankments would reach a size at which they could no longer be maintained. They would then burst, probably to the complete destruction of the country in the vicinity which would have been becoming lower and lower relatively to the level of the water in the river. Much the same phenomenon occurs when isolated areas are protected by embankments; the land around, subjected to an increased spill tends to rise, the height of the flood is increased, one proprietor raises his embankment, the others are bound to follow suit or be drowned out, and thus the vicious circle goes on until, in many cases, the protected area becomes little more than a low-lying swamp, surrounded by higher land on every side. There comes at last a time when the protective embankments can no longer be maintained; when this occurs the area behind them is infinitely worse off than is the unprotected area outside."

"After two tours throughout the areas in question, one of which was undertaken during the flood season, after consideration of the records of past years and of previous investigations which have been placed before us, and after collecting a large amount of new data on our own account, we have come to the conclusion that the problem which has arisen in Orissa is due, in the main, to the efforts which have been made towards its protection. Every square mile of country from which spill water is excluded means the intensification of floods elsewhere; every embankment means the heading up of water on someone else's land. Floods are inevitable; they

are Nature's method of creating new land and it is useless to attempt to thwart her in her working. The problem in Orissa is not how to prevent floods, but how to pass them as quickly as possible. And the solution lies in removing all obstacles which militate against this result. To continue as at present is merely to pile up a debt which will have to be paid, in distress and calamity, at the end."

"There has been nothing in our tour which has struck us as more pitiable than the position of the people sheltering behind some of these illusory defences. The inevitable has happened; the closing off of the spill water of the river has resulted in their land becoming far lower than that outside, the construction of similar defences by their neighbours has still further raised the levels of the floods, they have been forced to raise their embankments until a point has been reached when they can no longer be maintained, and they are subjected to calamities far greater than they would have experienced had they never enjoyed protection at all. Their prayer is all for higher and stronger embankments, not realizing that therein lies no salvation but only a further lowering of the relative level of their land and a short postponement of the ultimate day of retribution."

"The removal of obstructions to the workings of nature is, we believe, the only cure for the troubles to which Orissa is now subject. If a policy to this end is pursued steadfastly and, if needs be, ruthlessly, we are convinced that much of the distress which at present exists can be removed and stable conditions ensured throughout the country."

Every word I have just quoted might have been written for North Bihar.

Again, I recently visited the Hydro-Dynamic Research station at Khadakvasla near Poona to see to what extent it could help in the solution of our flood problems. After a full day's discussion with Mr. Inglis, the Superintendent, he has authorised me to say that in his opinion "the increase in flooding is entirely due to the mistake of your predecessors in embanking rivers in an alluvial country, as America and China have also realised. These embankments, by preventing even distribution of flood flow, have retarded natural land building and confined it to narrow strips and river beds with the result that rivers are rising quicker than the country is being built up, and, as years go by the flooding will become worse and worse. The only remedy is the removal of bandhs; then the lowering or extensive provision of causeways in all embanked roads, and when régime has settled down the provision of extra waterways under railways. Rivers should then be left entirely to their own devices except that they should be trained to flow through chauris to accelerate their raising to the general level of the country."

At the meeting of the Central Board of Irrigation which I attended last week in Delhi there was considerable discussion on the problem of waterlogging. This was almost entirely confined to waterlogging in the neighbourhood of canals and mainly due to seepage from canals, but a representative from Bengal gave the following reply to a questionnaire:—

"There are waterlogged areas in Bengal, but these are not concerned with irrigation. This waterlogging is on the increase in areas where the natural spill of rivers has been obstructed by the construction of marginal bandhs which have been erected to prevent the overflowing of the country. The beds of such rivers in such cases have silted up and the drainage of the country has been adversely affected thereby."

Owing to our predecessors' bandh policy North Bihar is now suffering from excessive floods and increased waterlogged areas and as long as these bandhs remain disasters due to unnatural flood conditions will become progressively worse.

But Bihar is not alone in reaping the ills of this unfortunate policy. China and America amongst others are in the same boat, and their conditions, I believe, are far worse than those we have yet attained. It is my firm belief



that by a resolute anti-bandh policy, steadily, but firmly, pursued over a number of years, it is not yet too late to restore the country to more natural conditions and to alleviate instead of accentuate the sufferings of the people. But the problem has ceased to be a purely engineering one. Vested interests have accrued, the Embankment Act has its limitations and needs revision and the Political, Revenue and Agricultural Departments will also be heavily involved if a solution is to be obtained.

The co-operation of all classes of the community is urgently called for and if this Conference, and eventually Government, accepts those views which are shared by all Irrigation Engineers and many laymen who have studied the problem, I propose as a first step a vigorous campaign by local officers and the press to educate the masses to become anti-bandh minded while Government concentrates its attention on practical means of putting the policy into execution.

If the bandh policy is pursued or even left in the *status quo*, I am convinced that we are storing up disaster for the future though we may not be here ourselves to witness the climax.

*The Hon'ble Mr. Anugrah Narayan Sinha*—Before we continue further discussions I propose to offer hearty thanks to His Excellency for having taken the trouble of coming here and making a very informative and careful speech and for taking further trouble and patience in hearing some of the addresses delivered here. I hope the entire House will join with me in my ambition to thank His Excellency. (Cheers.)

*His Excellency the Governor*.—I am very grateful to you all for your thanks. It has been a great pleasure to me to meet you all here. I am sorry I shall not be able to wait here to hear the discussions but I shall look to the results with great interest and I wish that you will have very profitable and useful three days here. Even if you will not find a final settlement, I think you will be a step forward.

(The Hon'ble Mr. Anugrah Narayan Sinha then took the Chair.)

*Rai Bahadur A. G. Chatterjee*, in a lengthy discourse, described the meteorological, orographical and geological condition of North Bihar and explained how deforestation accentuated flood conditions. He observed that North Bihar rivers had enough trouble of their own and that when burdened with man-made obstructions natural laws were upset and new conditions imposed and he blamed roads with inadequate waterways, fishing landhs, cultivation of drainage channel beds, marginal embankments, and railway embankments which were ruining the country, and he described several rivers as examples.

He gave the following as the more important causes of aggravation of floods :—

- (i) Deforestation, denundation and intensive cultivation of catchment areas,
- (ii) Meanderings of rivers for the purpose of land building,
- (iii) Obstruction of drainage by embankments with inadequate waterways,
- (iv) Construction of dams across streams,
- (v) Premature reclamation by embankments,
- (vi) Marginal embankments,
- (vii) Deprivation of spill channels of their share of supply,
- (viii) Cultivation in beds and on banks of rivers,

and considered dredging operations would be of value in North Bihar for enlarging tail reaches and outfalls and removing bars and sand banks.

Flood control measures that had proved partially successful in other countries were—

- (i) Retarding reservoirs and basins,
- (ii) Flood banks,
- (iii) Channel improvements,
- (iv) Diversions,

or a combination of all four, but meandering rivers should be left severely alone beyond fixing them with profiles near the border, diverting their flood water with caution, enlarging all road and railway bridges and dredging their outfalls.

He considered the Saran problem different to that of the rest of North Bihar and that hydro-dynamic experiments could not be relied on in connection with the Gogra. He advocated converting the Darauli road into a flood embankment for the present but with liberal and controllable provision for the influx of flood water to create a moderate flood over as large an area as possible as it would be disastrous to deprive the district of rich silt-laden flood water. The beneficial effects of additional fertility, replenishment of stagnant *chawrs*, increased production and above all the raising of low land by silt deposit more than compensated for occasional damage to crops. Returning to the general problem Rai Bahadur A. G. Chatterjee said that a definite policy for the progressive abandonment of all marginal and ring embankments, irrespective of proprietorship, should be laid down and strictly enforced. If any money was still left in the earthquake fund it should not be spent in furthering loss of life and property by the unfortunate post-earthquake concentration on raising roads without adequate waterways but should be utilized in providing such waterways.

While it was impossible and undesirable to prevent floods in North Bihar it was possible to devise means of reducing their effects. He fully realised the gigantic and expensive nature of the work but considered that—the Railway with their resources could shoulder their own responsibilities; District Boards could join hands and carry on in their own jurisdictions; Government should initiate investigations, prepare projects and co-ordinate activities; zamindars and the public would help with voluntary contributions; and a ten-year programme should be drawn up and strictly followed. But when channels are taken over for improvement the question of riparian rights would arise for which comprehensive legislation appeared necessary.

(The Hon'ble Mr. Anugrah Narayan Sinha called on Captain Hall to open the discussion on Saran floods.)

*Captain Hall.*—Sir, I will explain briefly how the question of Saran floods stands at the moment.

Following the floods of August 1936, Government appointed a Flood Committee to ascertain the causes of the flooding and to suggest any practical method of relief for the future of a part or the whole of the area flooded. The committee met and forwarded their proceedings to Government recording their opinion that the cause of floods was the spill of the Choti Gandak and the Gogra rivers. Their recommendations were that Guthni-Harpura, Darauli-Guthni and Chapra-Darauli roads should be raised 3' above the high flood level of 1936; that the embankment on the left bank of the river Daha from Phulwaria to Muhammadpur should be strengthened and extended to Chainpur, but they considered it most important that the embankment on the right bank should not be strengthened; that the Naini *bandh* should be strengthened and about 100' of extra waterway should be provided in the Chapra-Mashrak line for the protection of Chapra town for which purpose certain local board and municipal roads should be raised to prevent the Tel nadi water entering the town and that a new embankment should be constructed. After examination by the Public Works Department the Hon'ble Minister and His Excellency observed that a programme costing over

Rs. 4 lakhs could not be taken up without the sanction of the Legislature though the new Ministry might like to anticipate the sanction of the Assembly so far as the Naini *bandh* was concerned. The recommendations were considered by a Council of Ministers on 20th May 1937 which came to the following decisions :—

- (1) that the United Provinces should be consulted before the three roads were converted into a flood embankment,
- (2) that neither of the Daha embankments should be repaired or strengthened,
- (3) that the Naini *bandh* should be repaired but not extended for the present,
- (4) that additional waterways should be postponed till the result of repairing the Naini *bandh* had been ascertained,
- (5) that the local board and municipality should be asked to raise their roads.

I took action accordingly and in reply to my letter of the 24th May 1937, the United Provinces Government replied to the effect—

- (i) that the proposed embankment would inevitably endanger life and cultivation in the Ballia district on the south,
- (ii) that the Bengal and North-Western Railway from Raoti to the east of the Ballia district would be liable to be submerged and the Bengal and North Western Railway authorities should be consulted,
- (iii) that a forecast as to how the river would behave if the Flood Committee's recommendations were carried out should be investigated by the hydro-dynamic research station at Poona,
- (iv) that no action should be taken without reference to the United Provinces.

Government directed me to take action on the above lines and I accordingly addressed the Bengal and North-Western Railway, visited the hydro-dynamic research station at Poona personally and am continuing the correspondence with the United Provinces. That is how the matter stands at present.

Mr. Bradshaw-Smith from the United Provinces is here to-day to put the views of his province before this conference and the Railway are strongly represented and before we get on to a general discussion I suggest that we should hear their views.

Arising out of this problem a resolution is proposed to the effect that as both Bihar and the United Provinces are affected by the Gogra floods no action should be taken by one province which will adversely affect the other and that an inter-provincial board should be constituted and that no independent action should be taken by either province.

*Mr. Bradshaw-Smith.*—Sir, I am a Superintending Engineer in the Irrigation Department of the United Provinces and am chiefly interested in the proposal to raise the district board road along the bank of the Gogra in the south of the Saran district, which for reasons which must appear obvious is opposed by the United Provinces Government. Such an embankment without a similar embankment on the United Provinces side of the Gogra must aggravate flooding in the Ballia district of the United Provinces. Technical opinion in the United Provinces is also opposed to the confining of the river by bandhs on each side over a distance such as 50 miles, partly for reasons stated by Captain Hall, and partly on account of the difficulty of disposing of drainage water denied entrance to the river by the bandh itself. Flood conditions usually coincide with local rainfall, and though it may be conceivably possible to drain such water off in the Saran district, it cannot be drained

in the Ballia district owing to the area being surrounded by a wall of water. With heavy local rainfall such a bandh would usually be quite ineffective as there would be local flooding behind the bandh.

As regards my technical opinion on the behaviour and treatment of rivers flowing through their own alluvium which are in a semi-deltaic condition, such as the rivers of Bihar appear to be, I find myself in agreement with Captain Hall and put myself on the side of the *no-bandhwallas* except in special local cases where protection for economic reasons is vital. Such a policy benefits posterity and is poor comfort to the cultivators who suffer while the land building process is, by a series of floods, being advanced. It may well be asked why should we benefit posterity at the expense of the present generation. But will it be at our expense entirely? The additional yield from the rabi crops sown due to the fertilising silt does, in the opinion of a large body of people, more than compensate for the occasional destruction of the kharif crop by periodic flooding. I do not know the cropping in Bihar but this is a factor in the United Provinces. For instance, at a Flood Conference at Gorakhpur last year which I attended when the question of opening up a *nala* previously closed by a bandh was under consideration, I was surprised to find that the zamindar who had the biggest interest in the land behind this bandh was in favour of opening up this *nala* again and reverting to flooding as his land had, during the period of the closing of the *nala*, been starved of this beneficial silt.

In conclusion I trust the United Provinces Government will continue to be consulted before any action is taken in bandh construction on the Gogra, as the Bihar Government will certainly be so consulted before any action is taken by the United Provinces which might affect her interests.

*Mr. W. E. G. Bender*, Chief Engineer, Bengal and North-Western Railway, said that he had examined the proposal, for converting existing roads from Guthni to Chapra into a bandh to exclude the Gogra floods, as far as this was possible with the somewhat restricted data at his disposal, and considered it would be unwise to embark upon this undertaking without a complete survey of the areas involved, with a view to forecasting the results.

Guthni is a village a couple of miles from the Gogra river and about 9 miles south-west of Mairwa station and the length of the road which it is proposed to convert into an embankment is about 36 miles.

Between Mairwa and Chapra are a number of large streams running roughly north to south into the Gogra. Seven of these are important, for example the "JHARAH" crossed on a bridge having 5 spans of 80 feet, the "SONA" on a bridge having 6 spans of 60 feet and the "DAHA" on a bridge having 3 spans of 80 feet. Besides the 7 important rivers bridged by the Railway there are 44 other smaller channels each with its bridge and the total waterway between Mairwa and Chapra is 2,233 feet or nearly half a mile in width. To enable the water from all these streams to drain into the Gogra it would be necessary to have similar bridging in the proposed embankment otherwise this water would accumulate in, and flood, the very area that the embankment was intended to protect from the Gogra floods. If, however, the bridges were provided, the Gogra flood water would rush through them and defeat the whole object of the embankment.

Again, by preventing the Gogra water, during floods, from spreading towards the north-east, the whole of the excluded water would be added to that already in the narrowed Gogra channel the level of which might be raised several feet and result in greatly increased flooding on the right bank of the Gogra where, even now, the country is subject to high floods.

The Railway has records of the highest levels reached by the Gogra at the Inchcape bridge near Chapra during the last 20 years and there are indications that the levels are rising steadily. In the last few years all previous records have been exceeded on two occasions.

Investigations in the Punjab have established the fact that the rivers in that locality are steadily raising their beds and that in quite modern times (50 years or so) bed levels, and consequently high flood levels, have risen several feet.

This is in accordance with the well-known theory of the gradual building up of alluvial country by silt-carrying rivers and the same thing is undoubtedly taking place in the Gogra, the Ganges and the Sone and the levels of floods may consequently be expected to rise appreciably and progressively. Moreover, by restricting the area upon which a river can deposit its silt, the rate at which its bed will rise will be correspondingly accelerated and the inevitable result would be the same as that which has already been experienced in China and the United States where, in flood times, the rivers so treated run many feet above the adjacent plains, in artificially restricted channels, liable at any time to cause the most disastrous floods should one or other of the banks burst.

As regards the flooding which sometimes occurred north of Chapra and west of the Chapra-Mashrak Railway, Mr. Bender said that this had been caused by flood water from the Gogra flowing in a reverse direction, that is from south to north, through the Railway bridges west of Chapra and thence flowing east through unrepaired breaches in the Naini bandh which runs north from the west end of Chapra station.

In 1923 such an occurrence took place and the Railway constructed two causeways each 1,000 feet long in the railway between Chapra and Khaira in order to pass off this water to the east. This is not a situation where an extra bridge will do much good. The water is shallow but very wide and the causeways are the most effective way of passing it. The effect of an additional bridge would be negligible. If, however, the Naini bandh were repaired and strengthened this water could be excluded permanently.

In reply to a question put by Babu Prabhunath Singh, Mr. Bender stated that to deal with the flooding between Chapra and Sonapur due to the Ganges, the Bengal and North-Western Railway had prepared a scheme which included extensive bridging which would cost about 7,00,000 rupees. This scheme was with the Railway Board and was about to be placed before the Finance Committee for sanction and would probably be taken in hand shortly. The scheme included an off-flow bridge designed to drain the flood water from the Hardia Chaur in about 10 or 11 days so that those interested in the cultivation of the area known as the Hardia Chaur would be better off than ever before.

*Mr. Mathura Prasad*, speaking in Hindi, observed, that there should be no question of "bandh" or "anti-bandh" mentality but of improving the condition of the poor.

As by the use of electricity, gas and steam the world makes progress so the waters of Bihar rivers should be utilized for irrigation to increase the produce of crops. British statesmen and Congress workers are now united, have cheap labour at their disposal and should collect money and get to work.

His brother Mr. Dip Narayan Sinha had pointed out that loans were necessary. His Excellency had an open mind and had given constructive suggestions, but Captain Hall should be liberal and not raise his voice against embankments.

An expert committee should be formed to solve the flood problem when village people will realise that their poverty will disappear and will come forward and work.

*Mr. Prabhunath Sinha*, speaking in Hindi, said that embankments in some form or another existed along the Gogra before the advent of the British but were destroyed in the floods of 1838. The representative of the United Provinces Government should therefore realise that embankments are no new things and no objections should be raised from any quarter to their construction.

He advocated the abolition of the railway because embankments were only necessary as long as the railway existed. Embankments should exist as long as the railway and district board and local board roads existed.

He was glad to hear the Railway was going to spend seven lakhs on new bridges between Chapra and Sonapur but he asked for a *bandh* west of Sonapur station and a bridge at Mehura to help draining the Hardia Chaur which would only cost a few thousands of rupees.

*Rai Sahib Rai Prakash Narayan*, speaking in Hindi, said that his experience of fifty years was that the abolition of *bandhs* would prove harmful.

*Mr. Durga Prasad* did not advocate a combined United Provinces and Bihar flood board owing to the time it would take to arrive at decisions. This was the first time in the annals of British administration that non-officials, officials and experts had met together and they should come to speedy decisions. He said he would say more to-morrow when the problem of Purnea was discussed.

*Mr. Satya Narayan Singh*, speaking in Hindi, said that separate sub-committees should be formed for districts whose problems were the same, and *Mr. Bishundeo Narayan Singh* agreed.

*Mr. Amin Ahmed* considered that separate sub-committees would be a complication and that it was better to discuss the whole problem in the full House.

*Mr. Brijnandan Prasad* observed that the discussion was becoming confused, and the Conference should adhere to the predominant issue and concentrate on coming to a decision as to "*bandhs*" or "*no bandhs*".

He suggested sub-committees which would send a representative with instructions to a subject committee.

*Mr. Ram Charitra Sinha* wanted a subject committee to discuss the *bandh* or anti-*bandh* policy threadbare and then come before the full body with a definite policy. Different sub-committees would serve no useful purpose.

*Mr. Rambalak Singh*, speaking in Hindi, asked for a special sub-committee for Begusarai as its problem was exceptional.

*The Hon'ble Mr. Anugrah Narayan Sinha*.—"If that be the sense of the House that we should first sit in a smaller committee which will discuss the note prepared by Captain Hall and then the bigger body will take into consideration the advice of the smaller body, I think the House will be in agreement with the suggestion. In that case, the smaller body may consist of 15 members—the experts and Government officials being there *ex-officio*. The experts and representatives together will evolve certain formula which they will place before the Flood Conference in the form of a resolution. As I have told you, the basis of the discussion will be the note circulated by Captain Hall on behalf of Government. I may also tell you that the recommendation of the Conference will be of an advisory nature only. Government may accept the recommendations in toto or accept them in a modified form. That is entirely in the hands of Government to consider later on."

The following were selected to serve on the Committee :—

1. Mr. Ram Charitra Sinha.
2. „ Bishundeo Narain Singh.
3. „ Nirapada Mukharji.
4. „ Narendranath Das.
5. „ Rajendra Misra.
6. „ Durga Prasad.
7. Maulavi Saiyid Hussain.
8. Mr. Gur Sahay Lall.
9. „ Lakshmi Narain Singh.

10. Pandit Girish Tewari.
11. Mr. Dip Narain Sinha.
12. „ Satya Narain Singh.
13. „ Prabhu Nath Sinha.
14. „ Mahesh Prasad Sinha.
15. Thakur Ramnandan Sinha.

*The Hon'ble Mr. Anugrah Narayan Sinha.*—We will sit to-morrow at 2 P.M. There will be no meeting of the Flood Conference in the morning, on account of Armistice Day.

(*End of first day.*)

NOVEMBER, 11th.

(The Subject Committee met at 2 P.M.)

*Mr. Ram Charitra Sinha* supported by *Maulavi Saiyid Hussain* considered that more data should be collected before Government came to a decision as anti-bandh policy would affect the irrigation system of the whole province and would be an acceptance of defeat by nature.

*The President (The Hon'ble Mr. Anugrah Narayan Sinha)* here explained that if the hon'ble gentleman wanted the data which the department had collected to be placed before the Conference then the whole object of the Conference would be frustrated but if he wanted that before certain conclusions were arrived at all the available materials should be placed before the Conference then that was a different thing altogether. The problem of each part of the province is quite different from the others. The problem of North Bihar is quite different from that of South Bihar.

*Mr. Amin Ahmad* said it was not true to say we were going to surrender to nature. He had spent the whole morning reading yesterday's proceedings and considered we were in possession of sufficient data to know that some *bandhs* were doing great harm. In North Bihar several embankments were protective for one party but destructive for another.

*Mr. Mahesh Prashad Sinha* said that as Captain Hall's note was only supplied after the Conference had assembled it would be very difficult to come to a decision.

Each district had its own problem and that of Muzaffarpur was different from that of other districts. They were not afraid of floods in the Muzaffarpur district but of the consequences of floods. If flood water could be drained off immediately floods would be very beneficial as in the Sitamarhi subdivision where productivity was good and though the people got only one harvest they were happier than those who got no floods.

The problem of each district should be taken up separately and discussed with the experts.

*The Hon'ble Mr. Anugrah Narayan Sinha.*—What are the general principles which you want to be adopted?

*Mr. Mahesh Prashad Sinha.*—Sir, the first problem is how to drain off surplus water.

*The Hon'ble Mr. Anugrah Narayan Sinha.*—Take out *bandhs* and water will be drained off automatically.

*Mr. Mahesh Prashad Sinha.*—Sir, I am not convinced that by removing *bandhs* we shall have no floods. However, I will then take up the no-*bandh* policy.

*The Hon'ble Mr. Anugrah Narayan Sinha.*—There is no question of no-*bandh* policy.

*Bai Bahadur A. G. Chatterji.*—Sir, there are several kinds of *bandhs*, such as railway *bandhs*, ring *bandhs*, marginal *bandhs*, etc. This question of *bandhs* and no *bandhs* has been discussed throughout the world threadbare

and the conclusion of the greatest experts of the world is to remove the *bandhs* (*hear, hear*). For instance in Mississippi the Americans went on raising *bandhs* until disaster came after 15 years, and similarly they did so at several other places. Similar experiences were gained in the Volga in Russia. *Bandhs* were resorted to in Salonika and other places but after seven years' experience the Greeks are already finding that their embankments are getting overtopped and they are taking steps to stop this overflow. Again in the Po in Italy after about 50 years the embankment was submerged by two or three feet for miles and miles with devastating results throughout the country. In Bengal there are areas which were enclosed by ring *bandhs* from the floods of the Damodar, etc., and they are now at least 30 feet below flood level. Imagine how difficult it is to stop these floods! The policy should be to allow flood water to come inside the *bandhed* areas in controlled manner and not to exclude it. Once you control them, the inside areas will gradually be filled up and then the *bandhs* should be gradually removed. I think it will be a mistake to become *bandh* minded. Captain Hall's suggestion is the best suggestion and is the unanimous opinion of all experts throughout the world.

Mr. S. K. Roy, who entirely agreed with the "No *Bandh*" policy made the following proposals :—

- (a) Flood water should be regulated but existing *bandhs* should not be removed. Silt should be passed through all embankments and deposited on the fields, by means of sluices, regulators, etc.

Innumerable openings in *bandhs* would reduce flood intensity, raise the level of the fields and mitigate the flood menace.

- (b) Railway embankments and canals should be provided with additional waterways whenever the heading up exceeded one foot. All silt should be cleared from bridges.

- (c) Roads. Only arterial communications should be embanked with waterways. All other roads should be lowered to within one foot ground level.

- (d) All obstructions should be removed from rivers.

- (e) *Chauras* and low land should be raised by silt deposit.

- (f) Urban and *basti* areas should be protected with ring *bandhs*.

Mr. Satya Narayan Singh speaking in Hindi said that it often happens that the same embankment benefits some and damages others as he had observed with his own eyes. There are breaches in some embankments which the people are not allowed to repair under the Embankment Act and the pressure of water is now equally divided between the two sides, so it can confidently be said that the experts are correct.

The greatest problem is that of railway embankments and until sufficient waterways are provided the people cannot get relief; then come District Board roads and the problem cannot be solved till they also are provided with sufficient waterways.

Existing *bandhs* should not be interfered with.

The Hon'ble Mr. Anugrah Narain Sinha.—What is your view in respect of those embankments where breaches have occurred?

Mr. Satya Narayan Singh.—Those embankments should be left to their merits. We should be guided by the situation obtaining there.

Mr. Muhammad Shafi said we should divert the action of nature for the benefit of the people and that some *bandhs* were necessary for storing water. In Darbhanga district there are hundreds of District Board and Local Board roads and railway embankments across the drainage line of the district which cause flooding in certain areas. Would it not be better if we constructed channels and made provision for the passing of water? This



would accomplish two objects—irrigation in normal times and drainage in times of flood. The Bengal and North-Western Railway is the greatest obstacle to carrying out this policy.

*Mr. Bishundeo Narain Singh* endorsed Babu Satya Narayan Singh's remarks regarding the Bengal and North-Western Railway.

*Mr. W. E. G. Bender.*—I am glad to have an opportunity of clearing up one or two points that seem to have arisen during this Conference.

Firstly, I think that we must make a clear distinction between *bandhs* which have been built with the sole object of excluding water and those built with the object of providing communications, i.e., roads and railways.

Most of us agree that it would be best in the long run to remove all the *bandhs*, but we cannot do without means of communication, for to remove them would make the land quite uninhabitable and it would revert to jungle.

Secondly, I should like to clear up the question of the status of the Bengal and North-Western Railway. I feel that many of those here to-day have the impression that the Bengal and North-Western Railway is the "Bad boy of the family" and is the cause of most of the flood trouble because it will not spend money on adequate bridging.

I would remind you that with the sole exception of the Government itself, the Railway has a greater interest in the prosperity of the province than any other body. Their prosperity is absolutely dependent on the prosperity of the country they serve and their fortunes literally rise and fall together.

Moreover of all the railway lines in North Bihar only 150 miles of railway west of Sonepur belong to the Bengal and North-Western Railway and all the railways worked by that company east of Sonepur and north-east of the Gandak are the "Tirhut State Railway" entirely owned by the State and are in fact your own railway.

The Bengal and North-Western Railway Company are merely managers for the State, under a contract, and their only interest is a very small percentage of the earnings and if expenditure is necessary on bridging not one rupee would fall upon the Bengal and North-Western Railway Company and we could not have any possible object in withholding bridging necessary for the prosperity of the province.

As custodians of the interests of the Government we should advise them about bridging and our advice is usually accepted but might in certain circumstances not be followed for financial reasons".

Asked if the Bengal and North-Western Railway had ever advised extra bridging, Mr. Bender said it had done so, that besides the 7 lakhs of rupees worth of extra bridging which the Bengal and North-Western Railway had proposed on its own line, between Sonepur and Chapra, they had about 10 or 12 years ago recommended and constructed 4 causeways, each about a thousand feet long, between Saharsa and Bhaptiahi, to pass high flood water.

Mr. Bender went on to say that as the Bengal and North-Western Railway were prepared to spend 7 lakhs on bridging, at its own expense, on 30 miles of its own railway, it could not possibly be accused of parsimony.

Questioned as to why bridges had not been built between Khagaria and Kursela, Mr. Bender said that the reason was that the embankment ran on the divide between the Kosi and the Ganges rivers. The catchment areas of these two rivers were hundreds of miles apart and their floods did not occur simultaneously. Consequently, if the Ganges were in high flood, water would rush through such bridges towards the north and if the Kosi were in high flood it would rush through the bridges towards the south.

These rushes would at times be very great and would destroy a bridge unless it were made very large and very strong as was evidenced by the two enormous scour holes one 1,000 feet wide and 80 feet deep and the other 800 feet wide and 60 feet deep which were made when the bank was cut in 1916 or 1917 and which it was impossible to fill and still remain to be seen to-day.

The cost of such bridging would be so enormous that it would be impracticable to maintain railway communication between the east and west and the country traversed would revert to the condition of uninhabited grass jungle in which it was found when the railway was built 37 years ago.

*Mr. Satya Narain Singh.*—May I know if Bengal and North-Western Railway ever made any recommendations to the Government of India for opening up certain areas and if those recommendations were turned down by them?

*Mr. Bender, Chief Engineer, Bengal and North-Western Railway.*—Many times. If the project is a big one, they might not sanction it. I may give you an instance; In the neighbourhood of Saharsa the Company wanted to construct four causeways, each 1,000 feet long. This was not sanctioned.

*Mr. Bishundeo Narain Singh.*—Do we then take it that as the Chief Engineer you object to making openings on account of their enormous cost?

*Mr. Bender, Chief Engineer, Bengal and North-Western Railway.*—Of course the cost of erection and maintenance has got to be taken into account but there is another difficulty—you cannot always keep the flow of the water where you have built a bridge.

*Mr. Dip Narain Sinha.*—I thought that the points mentioned in my resolution were covered by the resolution of Mr. Satya Narain Singh, but after I have heard him, I see we are at the two extremes. So I hope you would permit me, Sir, to move my resolution formally: I read my resolution:

“As a measure for ultimate approach to the anti-*bandh* principle, this Conference recommends that steps be taken after thorough and scientific enquiry:—

- (i) to gradually remove all private *bandhs* within a period of not exceeding 10 years;
- (ii) to enlarge the existing waterways in the district and local board roads and railway embankments, where necessary; and
- (iii) to opening additional waterways in district and local board roads and railway embankments so as to ensure an easier and speedier flow of flood water.”

With the greatest emphasis that I can command I would request the House to accept my resolution. If we remove the private *bandhs* and if sufficient openings are made in the district board roads, etc., then the Railway company would be forced to keep more openings by the force of the water running straight into their own embankments.

The resolution was seconded by Mr. Mahesh Prashad.

*Mr. Satya Narain Singh.*—I have no quarrel whether there should be *bandhs* or no-*bandhs*. What I wanted to say was that something must be done by the district boards and the Railway company which will serve the full purpose.

*Mr. Nirapada Mukharjee* remarked that the experts wanted to persuade Government and the public to become anti-*bandh* minded and let nature take its course. That is a defeatist mentality but Government must help suffering humanity and the experts must find the means. If the anti-*bandh* policy will protect hearths and homes by all means resort to it; if not, do not resort to it. He found that private *bandh* should be done away with

but public communications kept intact but private *bandhs* could be counted on the fingers whereas public communications were too numerous to mention. If expert opinion is against the interest of the people it should be rejected, or in any case carefully scrutinized before being accepted as gospel, and he submitted it was based on inadequate data.

"What is the difficulty in training rivers?" he enquired.

*Mr. Dyer* :—"Who is going to pay?"

*Mr. Nirapada Mukharjee* :—That rests with Government. On behalf of all districts of Bihar he said they would gladly contribute their mite. The State could raise loans and the people would willingly pay the interest.

There is a large tract of maize land (in Monghyr?) which is laid waste every year. If Government listen to the experts the people will be left in misery, but if a *bandh* is constructed landlessness will come to an end. If our experts cannot cope with nature let them be brought in from outside. Given time our expert may change his mind so do not accept the general principle of "no-*bandh*" policy but let an experiment be made provided it is made with the railways and not with private *bandhs*.

*Pandit Girish Tewari* :—Speaking in Hindi said that the problem of Saran should be treated separately. The present necessity was to control rivers. The Naini and Daba *bandhs* and the Hardia Chaur needed special consideration and the public was ready to help Government. He did not favour the construction of big embankments but wanted existing *bandhs* made stronger especially the Adampur *bandh* for which only about Rs. 2,000 was required.

*Mr. Durga Prasad* :—Speaking in Hindi said that the head of water against the Palmer *bandh* which protected Purnea had increased and breached the *bandh* which should be made stronger to protect the thickly populated area which would be ruined by the abolition of the *bandh*.

*Mr. Prabhunath Sinha* :—Submitted that if *bandhs* injured the majority they should be removed and vice versa. If the railway does not help the people who help it to run it should be transferred to the Government of Bihar.

*Mr. Dip Narain Sinha* :—I have improved the wording of my own resolution which runs thus:

"This Conference is of opinion that obstructions caused by existing roads, *bandhs* and railway embankments have as a general rule accentuated the damage caused by floods and considers it imperatively necessary, after careful and thorough enquiry on the merit of each case, to remove *bandhs* and enlarge existing waterways".

*Captain Hall* :—Proposed that the resolution should include a clause that the Embankment Act should be amended to enable Government to deal with any situation that might arise.

This proposal was accepted and the President drafted a final resolution which read as follows and was unanimously accepted by the Subject Committee :—

The Conference is of opinion that obstructions occasioned by existing roads, *bandhs* and railway embankments have, as a rule, accentuated the damage caused by floods and considers it imperatively necessary, after careful and thorough enquiry on the merits of each case, to remove *bandhs*, enlarge existing waterways and provide additional ones in roads and railway embankments, when and where necessary.

Further, the Embankment Act should be so amended as to authorise Government to permit the construction of new *bandhs* in exceptional cases and to strengthen, repair and demolish existing *bandhs* and to provide for the constitution of Flood Committees to advise on problems relating to floods.

*The Hon'ble Mr. Anugrah Narayan Sinha*:—Now, gentlemen, we must have a Committee of the two provinces of the United Provinces and Bihar to discuss certain matters which affect both provinces. This will be placed formally to-morrow for your approval.

The meeting is adjourned till 10 o'clock of the next day.

(End of second day.)

NOVEMBER 12TH, 1937.

*The Hon'ble the President*.—Before we formally enter upon our discussion of the agenda, I shall call upon Captain Hall to move a formal resolution on the disaster that has just happened in China owing to breaches in their embankments.

*Captain Hall*.—Sir and Gentlemen, during the course of the last two days' discussion, references have been made to the fact that other countries besides India are suffering from the effect of *bandhs*, notably America and China whose rivers are very big. The Americans experience great trouble with the Mississippi and the Chinese with the Yellow river. The Chinese have had marginal *bandhs* along the Yellow river for about 1,000 years with the result that the bed for hundreds of miles is 40 to 50 feet above the level of the country. When these *bandhs* breach the resulting disaster is appalling.

You may have noticed in today's papers the harrowing disaster that has just occurred in China. I will read the news:

#### MILLIONS HOMELESS.

"The Yellow river has breached its banks and overflowed  $\frac{1}{3}$ th of the province of Shantung. Millions are rendered homeless and are facing starvation, while others are on the verge of ruin."

The province of Shantung is considerably bigger than Bihar and even allowing for press exaggeration, it is practically impossible to picture the immensity of this disaster. Those of us who advocate an anti-*bandh* policy have been accused of being defeatists but it is the saving of Bihar from a similar disaster that we have in mind.

I suggest, with the permission of the Hon'ble the President, that an expression of condolence and sympathy on behalf of the Conference should be conveyed to the Chinese Government.

The resolution was adopted and the Hon'ble the President promised to convey the expression of sympathy on behalf of the members of the Conference to the Chinese Government in due course.

*The Hon'ble the President*.—I will place before you the resolution arrived at yesterday as a result of our deliberations. I am glad that all opposing views have been reconciled and the resolution, the result of yesterday's deliberations is a compromise which accommodates all views. I will read the resolution now:—

"The Conference is of opinion that obstructions occasioned by existing roads, *bandhs* and railway embankments have, as a rule, accentuated the damage caused by floods and considers it imperatively necessary, after careful and thorough enquiry on the merits of each case, to remove *bandhs*, enlarge existing waterways and provide additional ones in roads and railway embankments, when and where necessary."

"Further, the Embankment Act should be so amended as to authorise Government to permit the construction of new *bandhs* in exceptional cases and to strengthen, repair and demolish existing *bandhs* and to provide for the constitution of Flood Committees to advise on problems relating to floods".

I believe that every view point that has been urged in the Conference and in the Committee yesterday has found acceptance in this resolution and that there will be no opposition to this resolution. If I am correct in my

surmise I shall certainly put this resolution to the vote. But before I do so, I shall give an opportunity to any member who was not present yesterday to make any recommendation he may like.

*Mr. Upendra Nath Mukharjee.*—“Sir, in this resolution no definite action is suggested. While I am not criticising the resolution, I regret to say that I find absolutely no scheme in it. Suppose, Sir, we remove the *bandhs*. What would be the effect? The effect would be simply mitigating the flood. But that is no remedy. I may say for your information, Sir, that the necessity of *bandhs* has always been felt. Take the Bir *bandh* which is 50 miles long with a base of 125'. This was constructed when there was no railway in existence. What I mean by this is that the problem of *bandhs* has no concern with the question of railways.”

*The Hon'ble the President.*—This resolution does not contemplate any scheme nor destroy any scheme. Any view can be accommodated by it, it is so comprehensive.

*Mr. Ram Charitra Sinha* wholeheartedly supported the resolution and hoped Mr. Upendra Nath Mukharjee would withdraw his opposition. He maintained that the American and Chinese problems were quite different to those of Bihar.

*Mr. Thakur Tewari* was not satisfied with the resolution and opposed it because no definite policy had been laid down. The policy of having *bandhs* with openings so that fertilizing silt should not be excluded was all that was required.

*Mr. G. P. Danby.*—Sir, “I am of opinion that the continual overflow of water from rivers in North Bihar during the rainy season is largely due to—

- (1) change in the level of the country since the earthquake.
- (2) action of the Nepal Government at the sources of these rivers.”

The extensive damage done by flooding is however due to *bandhs* and embankments which hold up the water. If there were no embankments or *bandhs*, the water from the overflow of the rivers would be distributed over the country and consequently would quickly subside causing a very limited amount of damage. These *bandhs* and embankments I put down as follows:—

- (1) the Railway embankments with insufficient waterways.
- (2) The District Board embankments with insufficient waterways.
- (3) Government *bandhs* and embankments,
- (4) Private *bandhs*.

Of these four, the Railway and District Board embankments are the chief causes of the trouble and until the Railway and the District Boards amend matters, this dreadful flooding must continue and eventually lay low a big area in North Bihar. The damage done by Government *bandhs* and embankments and by private *bandhs*, form a small proportion of this trouble as compared with the Railway and the District Board embankments.

In my opinion if anything is to be done we have to start with the Railway and make them put in sufficient waterways, likewise the District Boards. We may then abolish all Government embankments and *bandhs*, likewise private *bandhs*, but we have to start doing this at the source of the rivers and work down with the flow of the rivers. Again arrangements will have to be arrived at with the Nepal Government regarding many of these rivers which start from the Nepal territory, as I believe the Nepal Government continually divert the flow of the water from one river to another, causing heavy flooding in particular rivers.

In the meantime and until Government have decided on their line of action, I consider that where *bandhs* exist, repairs should be allowed to be made, but no increase in dimensions should be allowed, and no new *bandhs* made.

*Mr. Rameshwar Prasad Singh.*—“This resolution, Sir, is so comprehensive that I for one cannot follow the reasoning of my friends when they said that they have certain grievances against it. We are not going to demolish every *bandh*. As a matter of fact, His Excellency observed in his speech that each case has to be investigated on its own merit. Who can deny that ring embankments and private embankments have accentuated the damage done by floods? The Raj Banailly and the Raj Darbhanga have spent lakhs and lakhs of rupees over the Tiljuga *bandh*, but this *bandh* has created disaster all over that part of the province. The resolution does not say that there should be no *bandh* and so there should be no misapprehension that if people want a new embankment somewhere, they would be stopped from having it. I would request my friend, Mr. Mukherjee to withdraw his opposition.”

*Mr. G. P. Danby.*—My first suggestion is that if and when Government allow one *bandh* to be repaired, it should allow other *bandhs* to be so done. My second suggestion is that the Embankment Act be amended and that *bandhs* be allowed to be repaired pending the decision of Government. Unless railway *bandhs* and district board *bandhs* are done away with, the owners of private *bandhs* should not be asked to remove theirs.

*Mr. Brij Nandan Prasad* supported the resolution and wanted the Hon'ble Minister to examine every problem on the spot with a representative of each district and an expert and put up a scheme for discussion during the December-January session of the Assembly.

*Mr. Jamuna Karjee.*—“Sir, this resolution does not do any harm to anybody and so I do not think there is any scope for opposition. I have nothing more to say except a word or two with regard to the observations made by Mr. Danby. He has said among other things that the *bandhs* which have been breached should be repaired. I do not think that without making a careful investigation of the *bandhs* which have been breached it would be right on the part of the Government to allow any repairs to any *bandh*. This resolution gives enough scope for examination of such *bandhs* and I think we should not offer any particular suggestion with regard to any *bandhs* either filling up or opening without an expert examination of the *bandhs*. With these words, Sir, I support the resolution.”

*Mr. Upendra Nath Mukharji.*—Sir, in view of the observations of Messrs. Brij Nandan Sinha and Jamuna Karjee, I beg to withdraw my resolution.

(It was withdrawn.)

*The Hon'ble Mr. Anugrah Narayan Sinha.*—I take it that the resolution which I placed before the House is unanimously accepted.

The motion was adopted.

*Captain Hall* opened the discussion on the effect of the India General Steam Navigation Company's steamers on the left bank of the Ganges in the Begusarai area. He recalled the appointment of a Flood Committee earlier in the year to advise Government on the following points :—

- (i) To what extent, if any, bandalling work by the India General Steam Navigation Company was responsible for the erosion of the left bank of the Ganges; and
- (ii) whether this bandalling should be restricted or modified to train the cold weather supply down another channel.

The Committee, which met at Begusarai on November 17th and 18th, 1933, advised that :—

- (i) at each *ghat* there should be a jetty projecting not less than 50 feet from the bank except during the rains,

(ii) no jetty should be constructed within one mile of the Gupta *bandh* either upstream or downstream.

(iii) if there were two or more feasible channels, the one nearest the *bandh* should not be used by steamers.

A Council of Ministers held on May 21st, 1937, accepted this advice and the India General Steam Navigation Company were informed accordingly. The Company then protested against being compelled to construct jetties on the grounds that they were expensive and they would constantly have to move them, but a Council of Ministers held on July 22nd, 1937, declined to alter their decision.

Meanwhile Mr. Bishundeo Narayan Singh of Begusarai had petitioned Government to suspend the steamer service altogether for a period of two years stating that he represented the unanimous opinion of the locality. On enquiry from the District Magistrate Captain Hall was informed that the cultivators wanted the service suspended but the traders wanted it continued.

The India General Steam Navigation Company in reply to the final decision of the Ministers said that they had no alternative but to close the Ramdiri *Ghat* to traffic each dry season. Concluding Captain Hall said that the question still undecided was whether the India General Steam Navigation Company's service should be suspended at the request of cultivators who are under the impression that the steamers are responsible for erosion, or whether it should continue in the interests of trade and the travelling public.

*Mr. W. G. Came.*—“Mr. President, I inspected the place about two months ago and in my opinion bandalling must stop and further erosion avoided. The length of the Gupta *bandh* in 1920 was about 13½ miles and there was no erosion up till 1933. In the year 1933 and onwards serious erosion took place, and this state of affairs still continues. This year we constructed an embankment from the Gupta *bandh* for a mile or so in the direction of Begusarai and it is most important that we should not allow any further erosion of this *bandh*. In my opinion the method which is adopted by the Steamer Company is endangering the position, and that there is no need of docking of private steamers within one mile of the Gupta *bandh*. There is the possibility of moving to a site called Bikanpur, but if a *ghat* is to be maintained at the Gupta *bandh* the Steamer Company should be forced to make a jetty of 200 feet length to keep the channel away from the end of the *ghat*.”

*Mr. Nirapada Mukharji.*—Who pays for the cost of this bandalling—the Navigation Company or the Government?

*Captain Hall.*—The expenditure is paid by the Steamer Company but Government makes a small contribution.

*Mr. Nirapada Mukharji.*—What is the proportion of the contribution of cost?

*Captain Hall.*—Sir, I do not know the proportions. The United Provinces, Bihar and Bengal all contribute and our Government's contribution is very small.

*Mr. Nirapada Mukharji.*—Do Government keep any control over the bandalling of any portion of the river?

*Captain Hall.*—As far as I am aware, the Company has a free hand.

*Mr. Bishundeo Narain Singh* observed that this was not a case of *bandh* or no *bandh*, flooding or deposition of silt but of deprivation of land due to the India General Steam Navigation Company's policy of keeping the current as close to the District Board Road as possible to divert trade from the

Bengal and North-Western Railway. Their bandalling was starving the population but adding to their own coffers. He suggested that:—

(i) the *ghat* should be shifted for some years to the east of Samua; or

(ii) be done away with altogether.

The traders will not be losers and the new Government ring *bandh* costing Rs. 84,000 was in danger under present conditions.

*Captain Hall.*—I made a mistake just now when I said that the India General Steam Navigation Company had complete control over bandalling. Under the new agreement drawn up this March Government can order any bandalling to be modified or stopped altogether at their discretion.

*Mr. B. K. Gokhale* said that when asked to ascertain public opinion he asked the Subdivisional Officer, Begusarai, for a report which he submitted together with his own opinion that "Government should give an authoritative opinion on the damage, if any, done by the steamer service and take steps to stop or prevent the damage without stopping the service and thereby interfering with inland trade". That was still his opinion. As the steamers at present anchor in midstream whence cargo and passengers are transhipped in country boats and do not berth at *ghats* the recommendations of the Flood Committee may be said to have been fulfilled.

*Khan Bahadur Omar* said that local opinion was that bandalling was causing erosion and that there was a genuine grievance and Mr. Bishuideo Narayan Singh's request should receive consideration.

*The Hon'ble the President.*—"What is your suggestion? Should the *ghat* remain there or not?"

*Khan Bahadur Omar.*—"My suggestion is that the *ghat* should be shifted to the main channel and should not be allowed to remain where it is."

*Mr. Narayan Prashad Sinha.*—"Sir, my amendment is that the *ghat* should not be stopped altogether. Let us see how it works. If we find that by stopping the steamer service the erosion is stopped then stop it for ever. It should be stopped for 3 or 4 years for the present by way of experiment."

*Mr. Nirapada Mukharji.*—"A definite policy should be laid down if Government is at all willing to put a stop to this sort of thing. My suggestions are that—

(1) the river should not be trained in such a way as to take its course by the side of the northern bank.

(2) Government should have control over bandalling which should not be left in the control of the India General Steam Navigation Company.

(3) when the India General Steam Navigation Company makes a huge profit there is no justification for Government to make a contribution to them.

I have only made suggestions from a layman's point of view and want the engineer experts to give their opinion in the matter."

*The Hon'ble the President* here asked the members of each district to make concrete suggestions about their own districts. He said that they were at liberty to submit any suggestions later in writing if they liked.

*Mr. J. B. Sen* said that he had recently visited the Kosi area. In studying the Kosi flood problem it was necessary to bear in mind the quantity of silt this river carried, its unusually short length of 230 miles from the hills to the Ganges, and its constant change of channels due to land building. Its migrations resulted in disease, interruption of communications and water-logging. The people must be relieved of their misery. He gathered that they were willing to contribute to controlling the river. They wanted huge parallel *bandhs* but embanking was no remedy. 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. Nevertheless he considered the project



worthwhile as he visualised the installation of hydro-electric plant, the opening of the river to navigation and the development of irrigation. Water-logging should be prevented by providing more waterways across roads and railways.

The Kosi should be thoroughly studied not only from the engineering point of view but by the science of Physiography and a Geologist-Geographer should be employed at once.

[LUNCH INTERVAL.]

*The Hon'ble the President.*—As I stated before, I invite the representatives of the districts to make a statement of the problems which they consider deserve consideration. They should certainly try to be brief, because I have already suggested that each speaker should take 5 to 7 minutes only. Otherwise, it will not be possible to permit as large a number as we should like to participate in the discussion. I hope all of you will confine your speeches to the bare statement of points or problems which you think deserve consideration. The reporters will report your speeches and Government will pay due consideration to the points mentioned.

DISTRICT PROPOSALS.

**Darbhanga district.** *Mr. Satya Narayan Singh* enumerated the problems affecting the Darbhanga district as follows :—

- (i) *The Kamla* having changed its course frequently since 1925 is now causing havoc in many villages. He made the following suggestions :—
  - (a) Widening the Karahia, Rajnagar, Pilakhwar and Kakna railway bridges between Sakri and Jaynagar.
  - (b) Converting the causeway north of Madhubani into a big bridge.
  - (c) Clearing the old beds of the river to divide the current.
  - (d) Connecting the Dabhari *chaur* with the old river bed near Bhonar by a channel about half mile long.
  - (e) Constructing a *bandh* from Manisari to Jagaur tank for the protection of Jhanjharpur.
- (ii) *The Jiwach* now receives a portion of the Kamla floods and damages crops especially between Tarsarai and Darbhanga. He suggested :—
  - (a) Widening railway bridges and constructing new ones.
  - (b) Widening District Board Road bridges.
  - (c) Lowering the trolley line from Tarsarai to Ryam sugar factory.
  - (d) Connecting the Jiwach with Gansa ghat,
  - (e) Repairing the *bandh* from Malangia to Bhachli.
- (iii) *The Kamla, Thumane and Dhaus* rivers combine to flood villages in Benipatti and Madhawapur thanas. He suggested :—
  - (a) Desilting the channels.
  - (b) Repairing the Dhaus *bandh*.
  - (c) Providing a sluice in the District Board bridge near Durgas.
- (iv) *The Kosi and Tiljuga* flood the eastern and south-eastern portions of Madhipura thana and damage crops. He wanted *bandhs* constructed east of Rahnoly, Banarjhula and other villages.
- (v) *The Bagmati and Bur Gandak* flood a large portion of Warisnagar thana. He suggested deepening the bed of the Khanna Baha, connecting it with the Santi and constructing a *bandh* on the right bank to Ghogharaben.

- (vi) *The Kareh, Bagmati and Bur Gandak* flood the Rosera thana. He wanted the Kulwara and Punwa *bandhs* repaired and strengthened. The *bandh* which has been recently raised from Haya ghat to Baheri accentuates the trouble.
- (vii) *The Ganges* floods villages in Mohiuddinagar and Tajpur thanas. The Beri *bandh* should be repaired, strengthened and extended to Mahnar in the Muzaffarpur district.

He further wanted the chauris of the district drained, Government acquiring the land necessary for channels.

*Mr. Nirapada Mukharjee* suggested that :—

- (i) The Kosi should be surveyed, and the Nepal Government asked to grant facilities for the survey in their territory.
- (ii) A Kosi subdivision should be established with headquarters at Bhaptiahi to study changes of course and regulate flow down the various channels.
- (iii) The Railway Board should force the Bengal and North-Western Railway to carry out the recommendations of the Flood Committee of March 1937 and to provide extra waterways where breaches occurred in 1937.
- (iv) The earthquake department of the Public Works Department should be converted into a survey department, in charge of Mr. Came.
- (v) That the records of a committee which sat in Calcutta in 1896 should be studied.

He said that the cost would be about 50 lakhs, that 50 lakhs of acres were affected and that the people would willingly pay Re. 1 per acre so Government could have no objection to taking up the scheme of river training.

*Mr. Thakur Ramanandan Sinha*, speaking in Hindi, remarked that the Muzaffarpur district was particularly affected by flood and Government alone should find the money to save the situation. He suggested :—

- (i) The desilting of river beds.
- (ii) The draining of chauris.
- (iii) That Government should finance the "Bagmati Canal" scheme which was dropped in 1926.
- (iv) The diversion of the river Manusmara into the Bagmati or into Nepalese territory.
- (v) That a decision should be arrived as to whether the Sikao *bandh* should be maintained or destroyed. Those living north of it want it destroyed and those south want it maintained.
- (vi) Sufficient waterways should be provided in District Board Roads.

*Mr. Ramcharitra Sinha* objected to the construction of the Gupta ring *bandh* and wanted one to connect with the Tirhut Road near Balia. He also wanted Government to take over and maintain two private *bandhs* on the Bur Gandak.

*Mr. Rameshvar Prasad Sinha* recommended that :—

- (i) The Bagmati should be persuaded to flow in a definite channel or if this was impracticable that it should be prevented from joining the Bur Gandak.
- (ii) If found necessary the Lakhandeyi should be desilted.
- (iii) The *bandhs* along the right bank of the Bur Gandak should be breached at places to minimise the effect of floods on the left bank.

Muzaffarpur district.

- (iv) As the Ganges floods Mahnar thana every year an embankment should be constructed or the Hajipur-Mahnar road raised to protect the villages. The inhabitants would provide free labour.
- (v) A nala should be completely blocked to keep the Ganges out of Lewapur.
- (vi) The waterways in the south-west of the district should be improved to drain *chaurs*.
- (vii) The Baya Nala should be improved to serve the purpose of irrigation as well as drainage.
- (viii) Adequate waterways should be provided in road and railway embankments.

Purnea district. *Mr. Durga Prashad* drew attention to the extensive floods throughout the Purnea district and wished the Ministry complete independence of thought, decision and action.

Champaran. *Pandit Praja Pati Mishra* said that the floods in Champaran were not due to rivers but to *chaurs* being choked after the earthquake and that the solution was to drain them into the Baya Nala or the Gandak.

Monghyr. *Mr. Nirapada Mukharjee* said it was the misfortune of the Monghyr district that all the rivers of North Bihar fell into the Ganges in that district.

He wanted—

- (i) Sufficient waterways in the Bengal and North-Western Railway between Mansi and Kursala where none existed at present.
- (ii) Sufficient waterways in the Mansi-Bhaptiahi section of the Bengal and North-Western Railway.
- (iii) Government to consider the construction of a *bandh* from Gogri in Monghyr district to Lattipur in Bhagalpur district.

The people would pay half the cost.

*The Hon'ble the President*.—"Who will bear the other half"?

*Mr. Nirapada Mukharjee*.—"Government or landlords like the Banaili Raj".

He also wanted—

- (iv) The Jagmora and Kalwara *bandhs* repaired.

The District Board would raise the money.

Patna district. *Rai Sahib Raj Prakash Narayan* made suggestions about Patna district which have been recorded but are beyond the scope of the North Bihar Flood Conference.

Saran district. *Mr. Prabhunath Sinha*, speaking in Hindi, recommended that—

- (i) The Chhoti Gandak should be embanked.
- (ii) Adampur should receive immediate attention.
- (iii) An expert committee should be appointed to find means of protecting Sitabdiara village which is damaged by the Manjhi (Inchape) bridge.
- (iv) The extension of the Naini *bandh* by  $\frac{1}{2}$  mile.
- (v) Waterways in the Mogul *bandh* to drain the Hardia *chaur*.
- (vi) Agricultural interests should take preference over traffic.

Bhagalpur district (Kosi). *Mr. Rajendra Mishra*, speaking in Hindi, drew attention to the ravages of the Kosi.

He suggested that—

- (i) Government should reconstruct the Bir *bandh*.
- (ii) And also another *bandh* on the east bank in case the inhabitants of Purnea raised objections.
- (iii) If the Kosi could be controlled the people would pay the full cost.

*Mr. Amin Ahmad* complained of the exaggerated reports that appeared in the Press regarding the ravages of the Kosi and resented insinuations that District Officers knew nothing of what was going on in their districts. He said that the Kosi causing distress was nothing new but an annual event. He considered the experts had ample data on which to base their conclusions regarding *bandhs* and that any expenditure on reconstructing the Bir *bandh* would be waste of money. Some other means must be found and he refuted the suggestion that he advocated doing nothing. Bhagalpur district

*Rai Bahadur A. G. Chatterji* said the Kosi problem could be solved. The Kosi.

He advocated—

- (i) a *bandh* inside British territory with a profile head which would allow the water to flow down definite channels with no oscillation from side to side.
- (ii) checking the westward movement.
- (iii) then training the river down definite channels.

and estimated the cost at about 10 crores with an annual expenditure of half a crore which he did not consider undesirable expenditure.

He considered the Kursela bridge with eight spans partially blocked to be primary cause of the trouble, and that it was useless to try to solve the problem without making use of dredgers to stop shoaling and silting.

His estimate was made up as follows:—

Head works	...	...	...	2 crores.
Dredging, land excavation, etc.			...	5 crores.
Outfall, including dredging	...	...	...	3 crores.

*Mr. Jamuna Karjee*, speaking in Hindi, advocated adopting measures to stop the westward movement of the Kosi or a large area of the Darbhanga district would be ruined. He was not an expert and had no suggestions to offer. Darbhanga district.

*Pandit Thakur Prashad Tiwari*, speaking in Hindi, observed that if the Kosi problem was solved it would solve one-third the problem of North Bihar. It was not a fact that the Kosi brought silt from the mountains, it brought it out from under its bed and spread it around. We should not tackle this river from the mountains but in the plain. The slope of the river should be lessened when it will carry very little silt. Canals should be dug to divide its current.

*Mr. Kumar Chowdhary* observed that the rivers coming from Nepal flooded the Darbhanga district annually. Darbhanga district.

The main reasons for the floods were—

- (i) The Sikao, Udhi and Agropatti private *bandhs* and the Dudhail District Board *bandh* which obstruct the flow of water from north to south.
- (ii) Insufficient waterways in the District Board Road from Bajpatti to Darbhanga.
- (iii) Insufficient waterways in the railway line from Darbhanga to Sitamarhi.
- (iv) Raising of river beds after the earthquake.

Further north there was no flooding as there was no road or embankment of any kind to obstruct the flow. Memorials have been submitted for the demolition of the above mentioned *bandhs*.

Besides remedying (i) to (iv) Mr. Chowdhary advocated—

(v) the construction of a causeway 500 ft. long in the 14th mile of the Pupri-Runnisaidpur Road, and

(vi) if the proposed weir in the Sikao *bandh* is to be carried out, a gap of 500 ft. should first be made in the Udhi *bandh*.

Saran district.

*Pandit Girish Tiwary*, speaking in Hindi, wanted *bandhs* retained in the Saran district, several channels desilted and *chaur*s drained, and more railway bridges between Naini and Masrak. The Naini *bandh* should be extended and provided with sluices. The Hardia *chaur* should be specially considered.

Kosi.

*Mr. Bhupendra Narayan Mandal* described the ravages of the Kosi and said that he did not consider that it had yet been sufficiently studied scientifically. The services of great experts should be requisitioned and vast expenditure incurred. Zamindars and tenants would gladly contribute, the Railway should be made to contribute and Government find the balance.

He considered the Kosi should be distributed over the whole river area in a number of channels which should be cleared by dredges as they silted up. Alternatively, a *dam* might be constructed in the mountains and the water passed in a single channel to the Ganges.

He was in favour of an Inter-provincial Flood Board and advocated co-operation with Nepal. Nature should be harnessed to human advantage.

Kosi.

*Mr. Shiva Nandan Mandal* gave a history of the Kosi and described its ravages.

He proposed the following remedies :—

- (i) Training the river to keep to one or more channels.
- (ii) Regular dredging of silt.
- (iii) Marginal embankments.
- (iv) The establishment of a Kosi Commission.

*Captain Hall*.—“Owing to lack of time I had no opportunity of replying to sundry criticisms but the Hon'ble Minister has permitted me to add the following remarks to these proceedings :—

I. Two or three members of the Conference were of opinion that Government had insufficient data on which to condemn the *bandh* policy. This is not so. During the past few years every single *bandh* in the Champaran, Muzaffarpur and Darbhanga districts has been surveyed and another survey has been made of the network of *bandhs* which are responsible for the annual flooding of the Pupri area. The information so collected is ample for a comprehensive study of the *bandh* problem. These *bandh* maps have been printed and copies distributed to a few people concerned but it is regretted that the high cost of printing maps prevents a more general distribution. Should there be a demand for them on payment arrangements can be made to print more copies.

II. Another member declared that too much importance was being attached to private *bandhs* which were so few that they could be numbered on the fingers of one hand.

It is quite likely that individual members are only personally acquainted with a few *bandhs* but the survey referred to above shows that they exist in hundreds and generally in a most haphazard manner. Hence my opinion that such obstructions should be removed before roads and railways are dealt with. Though the question is open to controversy I consider it unwise to

spend large sums of money on additional waterways in roads and railways until other obstructions have been removed as their subsequent removal, non-removal or possible addition might easily render such waterways abortive.

III. Mr. Danby, in accepting the anti-*bandh* policy, advocated the removal of all *bandhs* and the provision of extra waterways under roads and railways, which is the ultimate solution of the whole flood problem; but he advocated starting from the source of a river and working down to the mouth. If this could be accomplished in one season it would be immaterial whether the removal of obstructions started from the source or the mouth, but as in practice any such action is likely to take a number of years the start should be made from the mouth and not the source.

As a simple illustration divide a river into 3 parts, the source, middle and mouth areas, and distribute the work over 3 years. If the source area is cleared of obstructions in the first year, during the following rains the flood would flow rapidly to the middle area which would be doubly inundated; and similarly if the middle area was cleared in the second season the mouth area would be trebly inundated.

On the other hand if the mouth area was cleared first there would be a quicker run off of the whole river and a reduction of flood intensity from the very start.

IV. In discussing the Kosi it was insinuated that the "experts" never visited and had no knowledge of the area and their opinion should therefore carry no weight against that of people living in the locality. This remark was doubtlessly made in ignorance of the amount of information that Government invariably collects before they consider a problem. As regards the Kosi not only have several officers, including myself, a personal knowledge of the area but Government is in possession of both ground and aerial surveys and are in a better position than anyone to realise the immensity of the problem.

V. It has been stated that the anti-*bandh* policy is defeatist and non-constructive. If the matter stopped there the accusation would be to some extent true but, as far I was concerned with the matter for discussion at this Conference, I wanted to make a start by establishing one point and one point only as a preliminary to Government devising a flood policy, i.e., 'that *bandhs* obstruct the free flow of water and accentuate instead of relieve the intensity of floods'. That point established the first stage of a constructive policy is to remove obstructions, thereafter Government can devise means of adapting the natural tendencies of rivers to benefit the people instead of opposing the natural tendencies to their detriment.

Engineers all over the world are admitting their mistakes in this direction and are now concentrating their attention on rectifying them.

VI. As I deliberately restricted my own observations on the flood problem to this one point Rai Bahadur A. G. Chatterji's observations on the Kosi had a constructive ring; but while appreciating the amount of work he put into his note I must somewhat damp his ardour with a word of warning. He described at some length the lines the Americans are now adopting in their endeavour to train the Mississippi with, I believe, some measure of immediate success though their long-sighted engineers are sceptical of permanent results.

But the Americans control the whole course of their river and have unlimited funds at their disposal. The Nepalese control the upper reaches of the Kosi and the Government of Bihar has anything but unlimited funds to expend on river training.

Practical engineering must go hand in glove with finance. This does not mean that the cheapest method is the best—frequently far from it—but it does mean that any engineering project must be within somebody's ability to pay.

Though I am not directly concerned with Bihar's finances I think I am right in saying that we could never afford to spend an initial 10 crores on training a single river with uncertain results.

VII. Mention was made of securing the co-operation of Nepal. Much as that is desirable I can hold out little hope of such co-operation. They were invited but declined to send a representative to the conference. I have had some experience with the Nepalese Government as regards river training and boundary disputes and I am afraid I can form no other conclusion than that they will never put themselves to any inconvenience for the benefit of Bihar.

VIII. Lastly, several members have protested against the proposed co-operation with the United Provinces. Lack of co-operation has been largely responsible for the present unfortunate situation as regards *bandhs* and embankments. Districts within the province, or even smaller areas, have undertaken flood protective measures with no consideration of their adverse effect on their neighbours. I hope, at any rate, that this conference has established the necessity of tackling the North Bihar flood problem as a whole for the benefit of the whole and not with reference to any purely individual advantage. Such co-operation must be extended. If the selfish attitude is adopted then for no other reason than that it is to Bihar's benefit to do so. Say Bihar cannot find the money to provide an embankment along the left bank of the Gogra in the Saran district but that the United Provinces finds the money to *bandh* their Ballia district. What would happen to Saran? The Americans appreciate this necessity and flood control is a federal subject which is not left in the hands of any individual State.

*The Hon'ble Mr. Anugrah Narayan Sinha (President).*—“Gentlemen, before concluding the proceedings of this conference I thank you one and all for having very kindly responded to my invitation and taken the trouble of coming here, sitting for the last 3 days, and listening to all sorts of discussions. I thank those gentlemen who came from outside my province, the experts from Bengal and North-Western Railway and the United Provinces and especially all the non-official gentlemen, who represent a vast number of the population of this province and who came to listen to what the experts have got to say and also to express their own views thereon, so that it may be possible either non-officially or officially to understand each other's point of view.

My chief object for convening this conference was that I should get a body of non-officials here to listen to what the Government have done, are doing, and intend to do, and at the same time the Government members and the Government spokesmen may also be in a position to listen to what the non-officials have got to say with regard to the various problems that face them, and which they are confronted with every day of their lives. Well gentlemen, it is the desire of Government to consider the proceedings of this conference much more seriously than has been done in the past and I can assure you that our Government are very anxious to do whatever it is humanly possible for any Government to do, to help the sufferers and to help the millions of people who have been exposed to the ravages of floods from year to year. At the same time I must make it clear that it would not be possible for any Government to come to a decision immediately on the various problems that have been discussed here. You must realise that each scheme which you have mentioned requires very great consideration, full enquiry and thorough survey and many other things before any definite conclusions can be arrived at. The problems are so many and of such far-reaching character and it may not be easy for those in charge to carry them out.

Within the three months that we have been in office we have realised the great responsibility which any Government have got to shoulder when they have to handle very important problems. Many of them have already been investigated by the Government Experts and from the reports in the files it is seen that each has its own difficulty and many difficulties in the way of execution.

Of course the question of finance is paramount. Some of you have mentioned that problems facing your districts will cost in some cases 10 lakhs, in some cases 3 lakhs, in some cases 2 lakhs, in some cases 50 lakhs and Rai Bahadur Chatterji has spoken of crores. If you will add up all these figures, you will realise the great financial burden involved. You will not, therefore,

be justified in thinking that any Government will be able to tackle so many complicated and expensive problems within a short time. Of course it is our earnest desire to start tackling those problems in a most serious manner which can easily be tackled. At the same time in tackling the more complex and complicated problems, delay is only natural. In handling this question the Government may have to take a more careful survey of the situation than as discussed on the floor of this House. Therefore, gentlemen, you should bear in mind that whatever the Government will do, they will do with the responsibility and interest which a popular Government ought to possess to render service to the suffering population; and, if any delay occurs in the execution of this, you should bear with me that that delay will be due not to any want of sympathy, any want of desire or interest to do as much as it is necessary to do but because of the problems being so vast and complicated. In spite of the best desire on the part of Government, it will not be easy for them to solve the problems immediately. Therefore it should be your duty to convey to the people whom you represent that there is nonetheless a great desire on the part of the Government to help them, but if they do not receive the relief which they expect without delay, they must not attribute it to callousness or want of sympathy and seriousness on their part but to the difficulty of the problem being so great that no amount of interest, desire or preparedness will enable any Government to solve it immediately.

Gentlemen, before I conclude I thank you once more and specially Nawab Ali Nawaz Jung, who has taken the trouble of coming all the way from Hyderabad at a very short notice. I am convinced that he has been taking a very keen interest in our proceedings for the last three days. He has very patiently listened to all the speeches and suggestions that have been made in this House. I may tell you that he is very anxious to help us with his expert advice. He wants more data before he can express his views and I have placed the services of one of my Engineers at his disposal who will acquaint him of the problems on which we hope to get his expert opinion.

*Pandit Girish Tiwary.*—(spoke in Hindi) “Mr. President, on behalf of this House I heartily thank you for conducting the proceedings of this Conference with great ability and for listening to the problems of every district so attentively.

We have been affected by flood and your heart is pained at the condition of the people. We have placed our troubles before you and have discussed them with you. You have conducted the proceedings very ably and I offer you our thanks. Every member knows in his heart that you are very resourceful and strong financier and looking to your past career I can say that you possess a very liberal heart and will leave no stone unturned to benefit the people.

We have placed many matters before you and there have been some attacks against the experts. We had some misunderstanding in respect of Captain Hall and I request you to inform him that we villagers think that all the experts stand in the way of public work and increase their expense. When resolutions were brought forward for the removal of *bandhs* we felt very anxious, but you very ably drew up a resolution which included all our views and which has been cordially welcomed by all.

We are short of funds and we know that our Bihar Government is poor. But we do not blame you for that. Probably you will not be able to give the full amount of money that would be required for our purpose, but we want to assure you that we are ready to help you. You are very popular with the people who are ready to work at your instance. Wherever Rajendra Babu and you yourself have gone people have worked fourfold. Though you have little funds at your disposal you possess the confidence of the public, and we therefore hope that you will send your experts wherever necessary. The distrust in the minds of the people against the experts can be removed. When the proceedings of these three days will be printed you will find it laborious to read them and difficult to put them into practice but lakhs of men are affected by floods. On their behalf I thank you for devising a means to remove their troubles for which purpose you have called together these experts and taken their opinion. I thank you heartily.



## ADDENDUM.

*Nawab Ali Nawaz Jung* subsequently submitted the note referred to by the Hon'ble Minister in his concluding speech.

After describing the formation of an alluvial plain and the causes of floods the Nawab stated that for protection against inundation it is necessary—

(i) to restrain the impetuosity of floods in rivers by retarding their flow;

(ii) to regulate their discharges and confine the water to the river channels;

and (iii) to improve the drainage of the valley; the works needed being storage reservoirs, embankments, outlets, lateral canals and cut-offs.

He then pointed out that—

Storage Reservoirs.

(a) After years of experimenting with levees (flood embankments) the Americans have now realised that the solution to the flood problem lies in the provision of flood control reservoirs in the upper reaches of rivers, and that such reservoirs have been adopted in other countries and in parts of India, but whether the practical application of this system will produce results commensurate with the enormous cost needs careful consideration. However, "the only effective solution for the control of floods is to be found in the construction of storage reservoirs for restraining and retarding them. All the other activities mentioned are subsidiary to this: rivers must be tamed before they are trained."

Embankments.

(b) Experience has shown that the policy of protection by artificial embankments is heading towards disastrous results. Silt, instead of being spread over the country and raising its general level is deposited in the rivers raising their beds and threatening devastation by breaching; and there is recurring damage to the land on the upstream side of embankments.

Where embankments must be retained on account of vested interests they must give absolute security and should be lined with asphaltmat, concrete or brick and most important of all, be provided with ample escapes to reduce the heading up of water.

To replace the haphazard system existing in Bihar by more scientifically designed embankments and to prevent the construction of new embankments Government should obtain complete control by revising the Embankment Act.

Outlet, cut-offs, etc.

(c) Drainage should be improved; depressions may be more important as flood absorption reservoirs than as cultivable land but they should be quickly drained to prevent epidemics and to assist nature in her land building. It is better to excavate channels than construct embankments. Cut-offs, to facilitate rapid drainage should not be undertaken until a river is under complete control or more harm than good will result and then the best solution should be determined by experiments on models.

Organization.

(d) A large and specialized staff will be required for flood remedial measures and an accurate contour survey of the country should be made by the Survey of India. A net work of stations to measure rainfall, snowfall, ground water levels, evaporation, etc., should be established. Streams should be gauged and a daily record kept of their discharges. A hydrographic survey is desirable and an intensive study should be made of each river basin. A weather bureau should be set up, a service of flood forecasting and warning organized, and a river training laboratory started.

It might be objected that such a programme was prodigious, especially with its associated developments (irrigation, navigation, etc.). That is so; but the problem must be approached with patience, determination and hope and should be dealt with as a whole and not piecemeal.

[This concluded the conference.]

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