

NATIONAL TRANSPORT RESEARCH CENTRE

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'CANAL ROADS FOR PUBLIC USE'
(FEASIBILITY STUDY)

NO.NTRC-35

- i) Mr. M. Sadiq Swati
Chief
- ii) Mr. M. A. Farouk,
Deputy Chief

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CANAL ROADS FOR PUBLIC USE

INTRODUCTION

In March 1979, the President was pleased to issue the following directive :-

'Road Communications are basic pre-requisites for development. I have been pondering over how our country's road communications, particularly in rural areas, could be increased. We have, perhaps, one of the largest irrigation networks in the world. In Sind, Punjab and NWFP, irrigation channels and canals, feeding water to villages, have service roads which are maintained by the Irrigation Department. These are, however, 'Kutchha' service tracks and, though manned by hundreds of gangmen, are yet not capable of bearing the load of sustained traffic. I am of the view that on one side along each major canal distributory or channel, a metalled road could be constructed. To start with, since service tracks are generally in good condition, these could easily be converted into metalled roads.

I would like Planning Division and Ministry of Agriculture to carry out a detailed study and prepare feasibility plan for this purpose, so that it could be put into operation from the next financial year'.

In compliance of the President's directive the Planning Commission constituted the following Committee to prepare the feasibility of opening up of canal roads for public use :

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| (i) | Mr. M. Sadiq Swati,
Chief, NTRC,
Planning and Development Division,
<u>Islamabad</u> | Chairman |
| (ii) | Mr. Bakhtiyar Hussain,
Adviser (Navigation),
Ministry of Communications,
Sectt. Block-'D',
<u>Islamabad</u> | Member |
| (iii) | Mr. A. S. Bokhari,
Director (Planning),
Ministry of Local Government and
Rural Development,
H. No. 314, St. 61, F-6/3,
<u>Islamabad</u> | Member |

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| (iv) | Mr. A. M. H. Kango,
Director (Water Management),
Ministry of Food and Agriculture,
<u>Islamabad</u> | Member |
| (v) | Mr. Muhammad Wasiuddin,
Deputy Secretary (Development),
Finance Division,
<u>Islamabad</u> | Member |
| (vi) | Mr. M. A. Farouk,
Deputy Chief, NTRC,
Planning and Development Division,
<u>Islamabad</u> | Secretary/
Member |

The Committee held a number of meetings and also discussed the matter in detail with Provincial Irrigation Departments, Punjab Highways Department and Punjab Planning and Development Department. The following officials of the various provincial government, rendered valuable service in completing the task :

- (i) Mr. Zafar Ahmed,
Deputy Secretary (Operation),
Irrigation and Power Department,
Government of Punjab,
Lahore
- (ii) Mr. Abdul Rashid Memon,
Deputy Secretary (Operation),
Irrigation and Power Department,
Government of Sind,
Karachi
- (iii) Mr. Saleem Akhtar Bhalli,
Director Planning and Design,
Highways Department,
Government of Punjab,
Lahore
- (iv) Mr. Muhammad Siddique,
Chief (Transport),
Planning and Development Department,
Government of Punjab,
Lahore

The Committee also visited upper Jhelum Canal which is open to public use, to see the practical implications of opening canal roads for public use.

The report prepared by the Committee is detailed as follows :

The Problem :

Pakistan has approximately 95,000 kilometers of roads, out of which are 31,000 kilometers are black topped, 24,000 kilometers shingled and 40,000 kilometer earthen roads mostly village tracks. The existing network of Highways in country suffers from two basic deficiencies namely inadequate coverage and imbalanced heirarchical setup.

Inadequate Coverage :

The road coverage in the country is approximately 0.12 kilometer per square kilometer which is one of the lowest in the world and is lower than other developing countries of the South Asian Region. According to Planning Commission estimates, the minimum coverage of road in any country should be at least 0.625 kilometer per square kilometer of the total area, to meet the transport requirement of development efforts and sustain the development efforts. This may be compared with 1.250 kilometer per square kilometer for England and 1.875 kilometer per square kilometer for France.

According to this criterion, a total of 793,500 kilometer of roads are required as against a total of 95,000 kilometers existing at present, thus leaving a deficiency of 698,500 kilometers.

Heirarchical Imbalance :

According to generally accepted standards, the Highway network of any country should have the following heirarchical

arrangement for deriving maximum benefits from it and meeting the transport requirement efficiently.

BALANCED HIGHWAY NETWORK

Type of Road	Percent			
	TYPE OF PAVEMENT			Total
	Non Paved	Single Lane	Two or more Lanes	
Main Rural	7	6	7	20
Local Rural	55	3	2	60
Urban Street	5	9	6	20
Total :	67	18	15	100

On this basis the distribution of various types of roads in the country should be as follows :

Type of Road	Kilometers			
	TYPE OF PAVEMENT			Total
	Non Paved	Single Lane	Two or more Lanes	
Main Rural	55,500	47,600	55,500	158,600
Local Rural	436,500	23,800	15,900	476,200
Urban Street	39,700	71,400	47,600	158,700
Total :-	531,700	142,800	119,000	793,500

From the table it can be seen that the largest chunk of roads required is local rural road (Farm-to-Market Road). Category wise deficiency of various types of local rural roads is as below :

LOCAL RURAL ROADS DEFICIENCY

Item	Kilometer			
	Non-Paved	Single Lane	Two or more Lanes	Total
Required	436,500	23,800	15,900	476,200
Existing	30,000	10,000	-	40,000
Deficiency	406,500	13,800	15,900	436,200

This is a substantial deficiency and at the present rate of constructing new roads, i.e. roughly 3,000 kilometers per year it would take 145 years to fulfill the need. The role of roads in the economic development of any country is undisputed. The importance of an adequate network of roads cannot be over emphasised. Therefore, it is, imperative that ways and means should be found to meet the requirements in the shortest possible time.

IRRIGATION NETWORK OF PAKISTAN

Pakistan has the world's largest Canal Irrigation System which mainly lies in the provinces of Punjab and Sind. The total length of the Canal network in the country is approximately 56,000 kilometer as detailed in the table below:

LENGTH OF CANAL NETWORK

Province	Main Canals	Distributaries	Kilometers	
			Minors	Total
Punjab	5,777	17,529	11,833	35,139
Sind	6,217	6,527	4,903	17,647
NWFP	716	973	569	2,258
Baluchistan	280	521	-	801
Total :	12,990	25,550	17,305	55,845

Note : In addition to the Canals, there is considerable length of drains having high embankments on both sides.

Most of these canals are in filling and the sides are in embankment (1.8 to 4 meters) above the adjacent land. All these canals have katcha paths, mostly of stablized soil and used primarily by the Irrigation Department officials for inspection purposes. Only a very limited number of these roads are open to public. Table below gives the total canal

roads open to public in various provinces :

Provinces	Total Canal length	Kilometers
		Open to public
Punjab	35,139	112
Sind	17,647	27
NWFP	2,258	187
Baluchistan	801	801
Total :-	55,845	1,127

Entry to remaining Canal Roads/inspection paths require special permits from Irrigation Department who generally dispose off the request keeping in view the type of the vehicle to be used to prevent excessive wear and tear of these roads. The physical conditions of the roads not open to public is generally very good as the Irrigation Departments expend considerable efforts to maintain the smooth riding quality of these roads. Irrigation Department does not receive any extra funds for maintenance and proper up keep of these roads. The task is entrusted to the labour employed for maintenance of the Canal themselves.

PAST EFFORTS:

In the past a number of efforts have been made to open the canal roads for public use to meet the growing need of communications in the rural areas. The public also have been demanding constantly to open these roads for public use. However due to a number of reasons, it had not been possible to use katcha canal roads to provide road communications especially in the rural areas of Punjab and Sind which have the largest potential for the purpose. The following reasons have generally been forwarded in the past against opening up

the canal roads for public use :-

- (i) Canal embankments are an exclusive and vital component of the canal system part providing un-interrupted water to the farmers. Allowing Canal embankments for use by public is liable to interfere in the overall working and operation of the Irrigation Department.
- (ii) Distributaries and minors are subject to frequent adjustments of outlets, fixing reclamation and 'Grow More Food' outlets and thus public traffic would hamper those functions and would itself get interrupted occasionally.
- (iii) Scope for future remodelling e.g. widening/raising of the channels shall be restricted.
- (iv) Canal banks are generally made up of uncompacted earth, may not have sufficient bearing capacity for heavy loading.
- (v) The existing culverts, bridges and regulators etc., are narrow and would have to be re-designed before they could be used for general traffic.
- (vi) Canal banks are generally much higher than the natural surface levels and much narrower than the minimum formation width of public road-ways. Making up of the full width of the required road formation would involve too much extra earth work which might make the whole idea un-economical.
- (vii) There are some pucca canal roads which do not permit speeds higher than 25 to 40 k.m. an hour on account of bad maintenance or settlement due to moist subgrade. If the same situation arises on all canal roads, apart from being rendered unfit for public traffic, these would make the canal maintenance almost impossible as well.
- (viii) Canal banks are designed to provide a minimum cover of 0.333 meters of earth over the hydraulic gradient-line, which results in the sub-grade being moist most of the

time. This may not be a desirable condition for a public road open to heavy traffic. Similarly the fact that canals are opened and closed frequently might also create unstable soil conditions.

- (ix) It will be difficult to deposit silt material on the banks obtained from periodical silt clearance. The leads and lifts will be more and desilting will become a costly affair, due to construction of the metalled roads on the banks of canals.
- (x) Specifications of canal bank profiles/sections are much more inferior than those required for roads. Extra land shall have to be acquired if canal banks are designed for general public traffic.
- (xi) Safety of Road Traffic in absence of wide berms without fencing will always remain a problem.
- (xii) In the events of vehicles falling into canal, would require its closing which is not desirable.
- (xiii) Canals are on serpentine and longest contours whereas the roads should be the shortest alignment/distance between any two villages to be connected. Thus aligning roads along canal banks will require link roads which would affect economy of converting canal road into public facility.
- (xiv) Changes in Irrigation outlets as a consequence of disputes, fragmentation of land holdings will be difficult in case the canal paths/banks are metalled for public traffic.
- (xv) The outlets on canal banks to be crossed will require proper design and construction, involving heavy additional investment in remodelling.
- (xvi) All canal system are proposed to be remodelled in the near future and so communications lines will then get disturbed for long periods.

The matter was however discussed in detail with the provincial Irrigation Departments. The Province-wise position is as follows :-

PUNJAB : The Punjab Irrigation Department has no objection in principle to the metalling of non-patrol canal banks if these are considered feasible by the Highways Department provided the following considerations are kept in view :

- (i) On distributaries and minors, there is frequent interference with the canal banks on account of shifting site of outlets, fixing and removing of seasonal 'Grow More Food' and reclamation outlets, forest outlets etc.
- (ii) Scope for future remodelling and widening especially for running additional Tarbela Water is kept.
- (iii) In the case of link Canals, the sections are not yet established and there are cases of side erosion resulting in the caving in of banks as in the case of metalled road on the Qadirabad-Balloki Link.
- (iv) The canal banks on all types of canals in filling are so designed as to provide a minimum cover of 0.33 meter of earth over the hydraulic gradient-line which would mean that the moist earth would be at a depth of roughly about 0.66 - 0.91 meters below the road surface level. This condition, it is felt would not provide a sufficient load bearing capacity required for a public road base.

SIND : The Sind Irrigation Department, instead recommends the metalling of all the existing Katcha village roads in the first instance on the ground that these connect most of the villages and Mandi Towns directly. Only for those villages which do not have any other alternate Katcha roads/links, the non-inspection bank of the selected reaches of distributaries and minors may be metalled to link such villages. The metalled links from such villages upto the distributaries/minors however should be the responsibility of Communications and Works Department. Whereas, the selected reaches of distributaries and minors will be metalled by Irrigation and Power-Department, the funds for this purpose should be made available to Irrigation Department outside the 'WATER-SECTOR'.

NWFP : In NWFP, canal irrigation is primarily carried out in the districts of Mardan and Peshawar. The NWFP Irrigation

Department is in complete agreement with the proposal to pave and open their roads for public use. They have already paved and opened approximately 187 kilometers of their roads. The NWFP Irrigation Department have also drawn a two years programme of paving approximately 230 k.m. of additional roads along major canals for opening to public use.

BALUCHISTAN : Baluchistan Irrigation Department also supports the proposal fully. As a matter of fact, the bank of both of their all main canals namely Patfeeder and Kirther are open to public. A large number of traffic including heavy public service vehicles use these canal roads even though at present they are Katcha. Government of Baluchistan would like to shingle these roads to provide better service to the public.

CONSULTANT'S VIEW :

In 1974, Planning Division appointed four teams of local consultants, one for each province, to carry out Farm-to-Market Roads Study in the following ten districts, which represent a fair sample of topographical, climatic, industrial, agricultural and mineral aspects in the country :

PUNJAB :

- Sheikhpura
- Rawalpindi
- Mirpur

SIND :

- Larkana
- Sanghar

NWFP

- Mardan
- Hazara
- Bajur

BALUCHISTAN :

- Quetta
- Mekran

The consultants for NWFP and Sind have also expressed their views on the feasibilities of paving of canal inspection

roads for incorporating these into the rural roads network.

Their comments are reproduced below :

NWFP : The consultants have made the following observations :

The Irrigation Department has a network of metalled and un-metalled roads running parallel to the canals in Mardan district. These roads are basically constructed for the maintenance of canals and as such their use is restricted to the general public as these are being considered as private roads. However, due to subsequent development of agriculture in the district and by attaining intensity of irrigation ranging between 120 to 200 percent, the agricultural activity in these areas have increased manifold requiring more roads of good quality. It has now become inevitable to allow for the general public use all the un-metalled canal patrol roads in the district. Before doing so, all such roads be properly improved so that it can withstand the vehicular traffic all the years round. It is strongly recommended to improve and upgrade all the un-metalled canal patrol roads, and opened to the use of general public. This is going to facilitate the movement of agricultural produce tremendously and shall thus contribute in a big way toward removing the deficiency of the Farm-to-Market Roads in the district of Mardan in the shortest possible time. The said proposal, if agreed to, is going to affect considerably the economic side of the proposed network of the Farm-to-Market Roads, of which the Canal Roads can form a major part. There are many more aspects of benefits which are as follows :-

- (1) All Canal Patrol Roads are connected to the village roads and the major and minor district roads leading to markets. As such their inclusion in the network of Farm-to-Market Roads is going to facilitate and remove to a greater extent the deficiency of the Farm-to-Market Roads.

At the same time it will make most of the farming areas easily accessible. The Canal Patrol Roads are of great importance connecting populated areas with each other. These Canal Patrol Roads are going to serve by transporting agricultural produce to various markets and to the rural population and shall thus serve as feeder roads leading to all districts roads and ultimately to market.

- (2) Areas all along the Canal Patrol Roads have achieved comparatively higher intensity of irrigation and as such these areas are the main centre of agricultural produce and have a higher use of the agricultural inputs. As such their transportation needs are higher and be given priority.
- (3) Almost all Canal Patrol Roads are generally passing through highly cultivated areas and densely populated villages where agricultural activities are at their peak. Most of important villages are located near and along the Canal Patrol Roads.
- (4) All Canal Patrol Roads can easily be up-graded at minimum costs to the desired standards with the least formalities and dislocations.
- (5) No extra cost is involved in land acquisition in almost all the cases. The land is extremely costly besides being difficult to acquire if not impossible due to dense cultivation and high prices.
- (6) The up-grading of the existing Canal Patrol Roads is going to save time tremendously as it requires mere conversion of existing roads by carrying improvements to the desired standard. New construction on different alignments is time consuming besides being expensive and problematic in such highly cultivated areas.

The improvements and metalling to the existing Katcha Canal Inspection Roads of 809 Kms mostly in Mardan district is strongly recommended. These roads pass through the areas which are intensively cultivated and heavily populated.

The upgrading and metalling of all the Canal Inspection Roads may be given a serious thought because the duplication of roads shall lead to considerable wastage of land and money. The canal roads will effectively contribute in removing the present deficiency of the Farm-to-Market Roads. Plans may, therefore, be prepared to black top in phases all roads except farm roads, which may first be properly graded and improved. All Canal Inspection Roads may further be extended and improved. These should be opened for the general public use. This will facilitate the movement of agricultural produce from the Farm-to-Market tremendously and shall thus contribute in a big way towards removing the deficiency of the Farm-to-Market roads in the shortest possible time. The proposal besides being economical and less time consuming connects all the densely cultivated areas and thickly populated villages, where agricultural activities are at the peak. Most of the important villages are closely situated to the existing alignment of the Canal Inspection Roads.

These Canal Inspection Road ultimately lead to markets via the village roads and the district major and minor roads. Hence, the Canal Inspection Roads can thus be co-ordinated to form a well knit network of Farm-to-Market Roads and shall thus fit in the overall frame work of the required network of Farm-to-Market Roads in the Study Area.

SIND : The Consultants for Larkana and Sanghar district in Sind have made the following recommendations :-

We still feel that upgrading of canal inspection paths to black top roads with improvement of width of the embankment where necessary is an ideal

arrangement and this has been substantially proved and established in case of such canal inspection paths already upgraded on upper Jhelum Canal (Mangla-Rasul) and upper Bari Doab Canal (Lahore Branch) within Lahore Town. The cost indications provided should be enough to allay any fears expressed by the Government of Sind.

The existing canal inspection paths/roads may be improved to the standard of black topped metalled roads, after they are declared as public roads. This would provide a substantial addition of 1092 Kilometers of black topped metalled roads which would provide additional road links and alternate routes to many villages and provide better and faster access to the various towns and markets. This would boost the density by an increase of 0.1715 Kilometer per square K.m. of the gross area of the district bringing the accumulative density of black topped metalled road to 0.4186 K.m. per square kilometer of the district.

However, the Irrigation Department of Sind do not agree with the finding or recommendations of the consultants.

INTERNATIONAL EXPERIENCE :

Many countries of the world use canal banks for public transportation. Both India and Egypt have canal irrigation systems similar to Pakistan. Their canal networks are not that extensive as of Pakistan but it is understood they have made use of the canal embankments for road communications in rural areas of East Punjab and border areas of Rajasthan. Egypt has also made considerable use of its canals and drains network in the Nile basin for road communications. In the developed countries of Europe and North America, considerable use of canals was made for public

transportation, around the end of last century. The barges used for this purpose were hauled by horse using the canal banks. However these canals were not Irrigation Canals as they were designed primarily as Inland Water Transport facilities and therefore did not have the problems faced in Sind and Punjab. Very little use is made of canal bank in Europe or U.S. for public road transportation at present.

DOMESTIC EXPERIENCE :

The domestic experience of opening the canal road has produced mixed results :

- (A) N.W.F.P. and Baluchistan : In NWFP and Baluchistan, the canal banks are quite extensively used for public transportation. The Irrigation authorities in both the provinces had a happy experience of letting the public use their canal roads. None of the fears expressed by Punjab or Sind Irrigation Department actually came true. As a result both the provincial departments are quite keen to open rest of their canals to public use.
- (B) Punjab : The members of the Committee undertook a field inspection of the existing paved road on the embankment of upper Jhelum Canal to see for themselves the condition of the road. The findings of the committee are as detailed below :

SECTION - 1 : The portion between Pakistan Highway to Mirpur was constructed by the Punjab Irrigation Department as a defence road on the right bank of the canal at a cost of Rs. 0.893 million in 1949-50. It is a 3.3. meter wide black top road located on 4.55 meter wide excluding 1.52 meter dowel (earthen embankment) of upper Jhelum Canal. Upto 1961 the road was primarily used by heavy traffic of Azad Kashmir territory. The private traffic was controlled by issue of canal road permits. In 1961, the road was thrown open to public.

Although the road was constructed at the instance of the Defence Department yet no funds were provided by the Central Government for the maintenance of this road. The Irrigation Department carried out the essential repairs out of the normal funds allocated to it for the maintenance of Upper Jhelum Canal. However, with the increased traffic and fast rate of deterioration of the road surface the meagre funds at the disposal of the Irrigation Department could not keep the road in a proper state of maintenance. Consequently the condition of the road deteriorated and presently it is lying in a state of complete disrepair.

The question of maintenance of this road had been attracting the attention of the Provincial and Central Government from time to time. There had been lengthy meetings between the representatives of the Provincial Government, Central Government and the Government of Azad Kashmir but no tangible results could be achieved. Presently the Azad Kashmir Government have undertaken the repairs of this road in their territory and are planning to complete the repair work by the end of this year.

SECTION-- 2 : The portion lying between Pakistan Highway and Rasul Head works is located on the left bank of Upper Jhelum Canal. The road pavement comprises of 2.42 meter wide and 121 cm. thick plain cement concrete slabs placed on 4.55 meter wide excluding 1.52 meter dowel of Upper Jhelum Canal. It was initially constructed by the Irrigation Department in the year 1945-47 for carriage of material etc. for the Rasul Hydel Station. The road was maintained by the Irrigation Department at the instance of Punjab Electricity Department/WAPDA upto 1965. Thereafter the road was maintained by the Irrigation Department out of its own meagre funds.

On account of public demand, the Irrigation Department in 1958 allowed plying of 2 buses of Ex-servicemen Co-operative Society from Rajar to Rasul. Subsequently with the development of the surrounding area and more pressure from the public, plying of two Government Transport

Buses was also allowed in 1960. The remaining traffic was controlled by issuing permits to light vehicles only (cars, jeeps, station wagons, pick-up vans, etc.). Presently around 80 annual permits are issued to 13 buses and 78 light vehicles.

During all this period the Irrigation Department had been maintaining this road out of their meagre funds meant for the maintenance of Upper Jhelum Canal. However, the rate of deterioration of the road had been more than the funds available at the disposal of the Department and consequently the major portion of the road have been completely rendered un-serviceable.

Due to increasing public pressure for opening this road to public traffic, the Commissioner Rawalpindi Division moved the Provincial Government in 1975 to transfer this road to the Provincial Highways Department for repairs and maintenance. The Irrigation Department readily agreed to this proposal. The Highways Department prepared a Project Estimate and P.C.I. costing Rs. 5.927 million for renovation of this road and submitted it to the Government for approval. This P.C.I. has, however, neither been approved nor the road had been taken over by the Highways Department.

CONCLUSIONS : Keeping all the relevant factors in view the Committee is of the opinion that opening up the canal road for public use would generally be advantageous viz-a-viz constructing the road on a new alignment for the following reasons :

- (a) Saving of land acquisition cost.
- (b) Saving on account of earthen embankment being available.

Saving in the cost of earth-work, however, may not materialize in every case for the following reasons :

- (i) Since the canal banks are usually much narrow and higher than the normal formation width and height

required for the road, therefore the additional quantity of the earth work required may exceed that of the road.

- (ii) Existing canal roads not being compacted to highway specifications, earth would have to be dug up and re-compacted.

Against the saving on account of the land acquisition cost and existing embankment for earth work, some additional costs are likely to be incurred in case of canal bank roads on account of the following items :-

- (i) Ordinary roads serve the population centres on both sides but in case of canal banks, one side would be obstructed by the canal. Bridges will have to be provided across the canals at reasonable intervals.
- (ii) Ordinary roads touch various population centres of a reasonable size but canals do not do so. Link roads will have to be provided.
- (iii) Canals are aligned on the basis of levels to command the surrounding area and not from the point of view of shortest distance between two given points. As such larger lengths of roads can result.

The Committee therefore recommends the following course :

- (1) NWFP : Since the Provincial Irrigation Department is quite keen to open up their roads for public use and has proposed shingling of a total of 231 k.m. of their canal banks, the federal government should provide necessary funds amounting to Rs. 4.55 million to the Provincial Irrigation Department during the current year to enable them to carryout the programme. This would be necessary as the financial constraints does not allow the Provincial government to cater for this requirement within their own

resources. The detail of their programme may be seen at Annexure-'A'.

(2) BALUCHISTAN : There are two canal systems in the Province namely Patfeeder and Kirther. The banks of both these main canals and their distributaries are intensively used by the public transport, as well as private vehicles. These banks serve as very vital links of communications between the various villages and townships located in the command areas of these canal systems. Because of the non-availability of alternate connecting routes almost all the buses ply on the banks of the canals. The canal paths and banks being katcha are frequently deteriorated on account of the heavy intensity of traffic. Therefore shingling and metalling of these banks and inspection paths, on a phased basis, as per the following programme will go a long way in providing better means of communications to rural areas and will also minimize the wear and tear of the canal banks :

- (i) The left bank of Patfeeder on which very heavy traffic ply needs to be metalled where as the banks of its distributaries are required to be converted into shingle road.
- (ii) The metalling of the main canal of patfeeder and its onward extension to Sui will provide a dependable and short route between Dera Murad Jamali and Dera Bugti. This route will in general play a very vital role in accelerating the pace of progress in the under developed areas of Kohlu Agency.
- (iii) The intensity of traffic on main canal of Kirther and its distributaries is comparatively less and as such these may be converted into shingled road in the first place.

The above proposal would entail an expenditure of Rs. 94.7 million and provide 704 K.m. of road for public use. It is recommended that during the current year

federal government should provide Rs. 25.00 million to enable Government of Baluchistan to convert approximately 150 kilometers of these banks into public roads. The detail of their programme may be seen at Annexure-'B'.

(3) PUNJAB AND SIND : In view of the genuine apprehensions expressed by the Irrigation Authorities of the two provinces, the committee feels that conversion of canal inspection roads in the two provinces should be done carefully as detailed below :

Each case should be taken individually and the following factors taken into consideration before it is decided whether or not the facility should be opened for public use :-

- (1) The length of all existing or probable links which could be used to connect the villages including inspection road, non-inspection path, road along a drain and altogether new alignment should be taken into account to select the most economical link.
- (2) The cost of land acquisition, if any, for right of way is to be quantified.
- (3) The cost of earthwork for a new road alignment and that of existing canal bank to be calculated.
- (4) The scope of the needed improvement should be decided keeping in view the expected/actual average daily traffic (ADT) as per the following criteria :

<u>A.D.T.</u>	<u>Scope of the Improvement</u>
0-50	Shingled
51-150	Shingle lane
151-7,000	Two lanes.

- (5) Cost of strengthening of road structures to the appropriate civilian/military loading class may also be taken into account.

- (6) The thickness of the pavement along the canal bank should be designed for moist subgrade conditions.
- (7) The level of the subgrade should be kept higher than the existing/future full supply water level (PSL) in the canal.
- (8) Any remodelling plan for the canal should be given the due consideration.
- (9) It may be ensured that the opening of the Canal Road for public use is in no way detrimental to canal operation, maintenance and inspection by the Irrigation Department Staff.
- (10) The canal inspection path should not be used for public transportation if it is only marginally more economical than the non-inspection path.
- (11) Highway Department should also take into account both the canal banks while constructing a new road in the area.
- (12) The Federal Government should provide Rs. 5.00 million to each province during the current year to enable them to carry out the necessary investigation to select the canal roads which could be opened for public use with advantage.
- (13) The funds for this purpose should be placed at the disposal of Highways Department of the two provinces.

ADMINISTRATIVE : The following administrative measures be taken before any canal bank is opened for public use in future :

- (1) The Federal Ministry of Local Government and Rural Development should co-ordinate the conversion of these roads into public facilities.
- (2) Positive arrangements should be made to provide specific and adequate funds for maintenance of the roads opened for traffic. Without this roads would cause too much damage to the canal system and would do more harm than good.

NWFP CANAL ROAD PROGRAMME

<u>S.No.</u>	<u>Name of Canal</u>	<u>Canal K.M.</u>
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Peshawar District

1.	RDO-23360 i.e. Tunnel outlet to Warsak Jamrud Road X-ing flow canal.	7.56
2.	RD-96400-184000 i.e. Kohat road X-ing Gravity flow canal to Chirat Road X-ing flow canal.	28.32
3.	RD-184000-203000 i.e. Chirat Road X-ing to link road, connecting Gravity flow canal and tail K.E.C.	5.99
4.	Link between Gravity Flow Canal and K.R.C. Tail.	4.83
5.	RD 12900-186000 i.e. from Warsak Jamrud Road X-ing Warsak Lift Canal to Tail Warsak Lift Canal	55.70
Total :		<u>102.40</u>

Mardan District

6.	Michni Branch Canal	37.89
7.	Pehur Canal	32.67
8.	Lower Swat Canal Kheshki and Few minors.	58.17
Total :		<u>128.73</u>

Grand Total : 231.13

BALUCHISTAN CANAL ROAD DEVELOPMENT PROGRAMME

	<u>Length</u> (Kms.)	<u>Cost</u> (Rs. Million)
I. <u>PATFEEDER</u>		
(a) Metalling of Main Canal	160	50.00
(b) Shingling of banks	416	26.00
II. <u>DESERT CANAL</u>		
Shingling of three distributaries.	75	4.7
III. <u>KIRTHER CANAL</u>		
Shingling of main canal	53	14.0
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Total :-	704	94.7
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