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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT PERFORMANCE AUDIT REPORT

ON

FIRST ICELAND HIGHWAY PROJECT

(LOAN 707-IC)

February 20, 1975

Operations Evaluation Department



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Currency Equivalent: Icelandic Kroner (IKr)

1970: US\$ 1 = IKr 88  
1971: US\$ 1 = IKr 87 (average)  
1972: US\$ 1 = IKr 90 (average)  
1973: US\$ 1 = IKr 84



PROJECT PERFORMANCE AUDIT MEMORANDUM

ICELAND FIRST HIGHWAY PROJECT (LOAN 707-IC)

This memorandum reviews the achievements of the First Iceland Highway Project, partially financed with Loan 707-IC. The loan, in the amount of US\$ 4.1 million, was signed on October 12, 1970 and fully disbursed in November 1973. This performance audit is based on a comparative review of (i) the Project Completion Report (Attachment 1) prepared by the EMENA Regional Office, (ii) information from Bank files (Appraisal Report, Loan and Project Agreements, Supervision Reports, and correspondence between the Borrower and Bank), and (iii) discussions with relevant Bank staff.

Project Objectives and Accomplishments

A 1968 transport survey conducted for the Government<sup>1/</sup> examined the need for various improvements in Iceland's road system. The survey report gave high priority to betterment of the road system around Reykjavik, where 50% of the country's population is concentrated. The necessity for road improvements was also recorded in the Bank report Current Economic Position and Prospects of Iceland, October 1969. These documented recommendations for road improvements led to the development of the project between the Government and the Bank.

The objectives of the First Highway Project were to help finance upgrading of about 47 km on two primary roads -- 13.7 km on the "Vesturlandsvegur" Road and 33.6 km on the "Sudurlandsvegur" Road -- radiating from Reykjavik (PCR Map 2) and purchases of highway maintenance equipment. The project consisted of (a) construction of about 40 km of roads to replace existing ones which were poorly designed and surfaced with gravel that required constant maintenance and improvement; (b) paving of about 7 km of existing roads; (c) consultant's services for construction supervision; and (d) purchases to replace old road maintenance equipment (PCR Annex E) and provide snow removal equipment on surfaced roads. The project roads were divided into 3 sections on the Vesturlandsvegur Road and 4 sections on the Sudurlandsvegur Road. The sections were small, ranging from 3 km to 14 km (PCR Annex B), to keep construction within the capacities of small local contractors.

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1/ Kampmann, Kierulff and Saxild (Copenhagen), Transport Survey of the Republic of Iceland, February 1969, 2 vols.

This project represented the Bank's first experience in Iceland's transport sector. Previous Bank loans had embraced the power, agriculture, industry and water supply sectors.

The total estimated cost of the project was US\$ 7.66 million equivalent. The Bank loan of US\$ 4.1 million for the foreign exchange costs of the project was for a 20-year term, including a four-year grace period, at 7½% interest. The main loan covenant required that the Government complete the construction of 16 km of roads adjacent to the project highways by the expected completion date. Further, the Government agreed to permit foreign contractors to employ expatriates as reasonably required. The executing agency was the Public Roads Administration (PRA), which is responsible for construction and maintenance of all roads. The PRA and a local consultant prepared the detailed engineering design of the road sections.

The Bank had deemed the PRA sufficiently capable to execute the road program, hence no particular institutional difficulties were anticipated. Prior to this loan, road construction in Iceland was generally implemented by force account. In contrast, private construction firms were contracted to execute this project and independent consultants provided the necessary supervision according to usual Bank practice.

Initially, project completion was scheduled for the first quarter of 1975, with a loan closing date of June 1975. Subsequent revisions of the construction schedule estimated a new completion date of June 1973. All construction and disbursements were completed by November 1973, slightly beyond the revised completion date, but considerably ahead of the original closing date.

All project objectives were met, and loan covenants fulfilled. The two road sections were improved and new maintenance equipment was purchased. The quality of road construction was "good and probably better than before...because of more precise specifications and good supervision," according to the PCR. The actual cost was US\$ 9.05 million equivalent, an 18% overrun over the appraisal estimate (including contingencies):

ICELAND: First Highway Project

Summary of Estimated and Actual Costs

	<u>Appraisal</u> <u>Estimate</u>	<u>Actual</u>	<u>Percent Change</u>
	(mill. US\$ equiv.)		
Road Improvement and Construction	6.35	7.92	+ 25
Consultant's Services for Construction Supervision	0.77	0.60	- 22
Road Maintenance Equipment	0.54	0.53	- 2
Total	<u>7.66</u>	<u>9.05</u>	+ 18

The overrun of approximately US\$ 1.39 million equivalent was absorbed by the Borrower. The difference between actual cost and the appraisal estimate resulted from quantity and design changes and from overall construction cost escalation: the quantity changes were due to an underestimation in earthwork stemming from inadequate soil information, mainly on the Vesturlandsvegur road. In retrospect, additional subsurface soil explorations would have been desirable. The unexpected difficult soil conditions encountered on section VV4 of the road were evident only after construction was initiated. Soil analysis undertaken on the site did not reveal the extent and depth of difficulties subsequently encountered. Realignment of the road to an area with better soil conditions was not possible due to the location of the road near the sea. Abandonment of the improvement of the portion of VV4 where difficult soil conditions prevailed was not considered. The main design change, made with the Bank's concurrence, was partial substitution of concrete paving for asphalt cement. Estimation by the Bank of the economic rate of return for the use of concrete as compared to asphalt in Iceland indicated that the design change was justified.<sup>1/</sup> Concrete pavement was therefore substituted for asphalt on 13.7 km of the Vesturlandsvegur road. The total

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<sup>1/</sup> Concrete pavement was estimated to last 20 years; in comparison, asphalt pavement would require resurfacing every 4 to 6 years.

cost increase due to quantity and design changes was 21% over the bid price (excluding contingencies); the appraisal estimate had included only a 10% contingency for quantity and design changes.

The cost overrun was also the result of inflation, which increased construction costs by 16% over estimates; the appraisal estimate had included only an 8% total construction price escalation.

### Economic Return

The 17% rate of return for road construction (including supervision) estimated at the time of appraisal differs from a revised estimate of 12% made with 1974 factor prices (PCR Annex H). In the revised estimate, both road sections have the same 12% return, but originally it had been expected that the Vesturlandsvegur Road would have a 22% return and the Sudurlandsvegur Road, 14%. On the former road, the steep decline in the return of the investment is due to the cost increase and a 15% traffic overestimation. Had petroleum prices not risen, user benefits would have been 15% lower than current estimates. On the latter, increased benefits, derived from increases of 6% in traffic and 15% in vehicle operating costs due to rising petroleum prices, could not fully compensate for the increases in construction costs.

The revised rate of return for individual road sections indicates that the return for one section designated as VV4 was low: 5% as compared to 11% estimated in the appraisal report (PCR Annex H). This 4.5 km section was located at the end of the betterment on the Vesturlandsvegur road farthest from Reykjavik. Its estimated cost was US\$ 0.77 million, or 10% of the total project; actual costs were US\$ 1.56 million, or 17% of the project. The lower return can be accounted for by both the substantial cost increases and a reduction in user benefits. The cost increases resulted from increased earthwork over that estimated due to unexpected soil and material conditions, especially on the last 750 meters of the section. Design changes resulting from the substitution of concrete for asphalt pavement caused additional cost increases; however this increase was offset by the lower maintenance cost of a concrete pavement as compared to asphalt pavement. The reduction in benefits stemmed from a 23% traffic overestimation for 1973 (PCR Annex F). An adjustment of the road user savings calculation to take account of the fact that the use of truck-trailers -- which are more economical than normal trucks -- has grown considerably, would increase the revised rate of return on this section from 5% to approximately 6%. Truck-trailers now represent about 10% of total truck traffic.



### The Bank's Role

On the whole, the Bank's handling of the project was satisfactory, and efficient. Its role was relatively minor in project implementation; in fact it minimized involvement in handling questions normal to project execution.<sup>1/</sup> Yet the Bank also demonstrated vigilance in project monitoring; for example, it denied a request for the purchase of maintenance equipment which was not economically justifiable. Furthermore, Bank input, when required, was rapid and straightforward. It was flexible in handling design changes, for example, the substitution of concrete for asphalt as a pavement material.

An additional benefit of the Bank's participation was to further PRA's experience in road construction by private firms, with independent supervision, as an alternative to force account. This experience was instrumental in modifying PRA policies to include the use of contractors on large road projects. Further, requiring independent consultant supervision of construction provided a useful element in settling contractors' claims and may result in more precise contract preparation in the future. The project also provided opportunities to private local firms which previously lacked experience in road construction and supervision. The PRA considers that these indirect benefits would result in more economical roads in the future.

### Conclusions

There were no major issues related to this project. The original objectives were accomplished and the Bank's performance in project management was satisfactory. Bank action was rapid and straightforward, with adequate supervision and flexibility in management. However, an 18% cost overrun occurred. This overrun (together with the traffic shortfall on the Vesturlandsvegur road) is reflected in the discrepancy between the newly estimated 12% rate of return for the project and the 17% return estimated during appraisal. In retrospect, the low rate of return calculated for one section of the Vesturlandsvegur Road (VV4) suggests that improvement should have been postponed.

The cost overrun also reflects the difficulties in estimating costs during an inflationary period. At appraisal an 8% total price escalation allowance was included in the estimate, which turned out to be insufficient.

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<sup>1/</sup> Only three short supervision missions were made to Iceland.



PROJECT COMPLETION REPORT  
ICELAND FIRST HIGHWAY PROJECT

A. General Description and Purpose of the Project

1. The main purpose of the loan (US\$ 4.1 m) was to assist in financing the construction and improvement of about 47 km of primary roads in the vicinity of Reykjavik (Vesturlandsvegur, northeast from Reykjavik and Sudurlandsvegur southeast from Reykjavik - see Map). The loan also included the purchase of highway maintenance equipment. Project data are attached as Annex A.

B. Road Construction and Improvement

2. A Transport Survey, financed by the Government and carried out by consultants (KAMPSAX) in 1968, gave high priority to the replacement of the heavily trafficked gravel road sections near the capital with modern surfaced highways. Only 50 km of roads were paved in the whole country at that time.

3. Detailed engineering and the preparation of contract documents were carried out by the Public Roads Administration (PRA) with the assistance of local consultants. The final contract documents were reviewed by the supervisory consultants MAT S/f, Reykjavik.

4. The roads were divided into small contract sections in order to encourage local bids. Four out of seven contracts were awarded to local contractors (55% of the total value) and the remainder to a Danish-Icelandic joint venture. Construction contract details are shown in Annex B. The delays in completion of construction were only slight, on the average about 8%.

5. There were few problems during the construction. Some difficulties arose in settling the contractors' claims relating to price increases. The following aspects were not adequately covered by the Price Variation Clause of the Contract Agreement:

- (i) increased costs due to wage and vacation allowance increases and shortening of the regular work week from 44 to 40 hours;
- (ii) increased employers' payments to Laborer's Pension Fund; and
- (iii) increased road taxes for diesel trucks.

6. Only one major design change was made - the substitution of cement concrete pavement for asphaltic concrete on three road sections of Vesturlandsvegur adjacent to Reykjavik (VV2, VV3 and VV4). The Bank concurred with the change which was economically justified for these higher traffic sections and especially because of the use of studded tyres (estimated traffic ranged from 2200 to 6000 vpd in 1973). There were minor geometric design changes which resulted in lower costs.

7. The quality of construction was good and probably better than generally before in this country, mainly because of more precise specifications and good supervision.

8. The final costs compared to appraisal cost estimates are in Annex C. The following points arise from these figures:

- (i) the total bid price (excluding quantity and price variations) for all road sections was only 5% above the equivalent appraisal estimate;
- (ii) due to substantial quantity increases and price escalation, the total final cost is 21% higher than the equivalent appraisal estimate;
- (iii) the cost escalation from quantity increase and design changes was 21% (10% estimated at appraisal) and from price escalation 16% (8% estimated at appraisal).
- (iv) the highest cost increase (50%) was on section VV4, mainly because of increased quantities, specification changes and price escalation. A considerable part of the increased quantities was caused by the unsuitability of material from the sea water and fresh water ponds related to the salmon fishery, which the route traverses. Detailed information in this respect is given in the letter from the Public Roads Administration dated October 11, 1974.

Most of the quantity increases were due to additional excavation and replacement of unsuitable materials. This in turn reflects that additional subsurface explorations and study of the effect of frost would have been desirable since there are difficult soil conditions in this part of Iceland.

#### C. Supervision of Construction

9. Supervision of construction was by a local consulting organization (MAT S/f, Reykjavik) with staff strengthening for short periods by Danish soils and asphalt paving engineers. All major decisions were made in cooperation with the PRA.

10. The quality of supervision was good. Materials testing was carried out by the soils and materials laboratory within the Government Building Research Institute (BRI) and the results were evaluated by the consultants. In addition to their normal supervisory duties the consultants initiated several design changes to improve quality and/or reduce costs.

11. The cost of supervision was close to the appraisal estimate (Annex C). The somewhat high costs (7.7% of construction costs) compared to average supervision costs arise from:

- (i) the construction was broken down into 7 small contracts to encourage domestic participation; and
- (ii) very little previous experience of major road construction contracting by the PRA, contractors and consultants.

#### D. Road Maintenance Equipment

12. This loan category financed the replacement of selected items of old and uneconomic highway maintenance equipment and the purchase of snow-clearing equipment for use on surfaced roads (largely on the project roads). The costs (appraisal estimate and actual) are shown in Annex E. The total actual cost was only slightly higher than appraisal estimate (less than 2%).

13. There were, with the Bank's concurrence, some changes in the list of equipment of changed actual needs:

- (i) the wheel loaders were substituted for the shovels; the final number of wheel loaders was 4 (5 at appraisal) but two of these were 3 cu yd (2 cu yd shovels at appraisal);
- (ii) the final number of motor graders was 6 (7 at appraisal);
- (iii) the final number of snow blowers was 2 (1 at appraisal);
- (iv) the amount of spares was smaller than estimated (1/3 of appraisal estimate).

14. All equipment was received as scheduled and put into effective use. The snow clearing equipment has enabled the PRA to keep a number of additional important road sections mostly open to traffic during the winter months.

E. Economic Analysis

15. The objective of the project was to reduce the cost of transport on important sections of the two main roads radiating from Reykjavik by replacing or improving the existing inadequate gravel sections. The average daily traffic volumes on the project road sections as estimated at appraisal and from actual counts in 1973 are shown in Annex F. Average actual traffic on Vesturlandsvegur is about 15% below the estimated volumes, mainly due to reduced car traffic; no specific reason was found for this variance and apparently the appraisal assessment of the prospects for traffic growth on this section was too optimistic. Traffic volumes on Sudurlandsvegur are about 6% above estimated volumes.

16. The principal benefits derived from the project are savings in vehicle operating costs. Vehicle operating costs by road section are shown in Annex G as estimated at appraisal and as revised on the basis of updated operating cost information supplied by the Government in early 1974. The Annex shows that average vehicle operating cost, and therefore savings, have increased by an average of 130% from 1970 to early 1974; this increase is partly due to inflation (115%), partly to the recent producer price increases in petroleum products (15%).

17. The rates of return of the project road sections are shown in Annex H, as estimated at appraisal and as revised on the basis of updated traffic and vehicle operating cost information supplied by the Government in early 1974<sup>1/</sup> The Annex shows that the revised economic return (ER), excluding benefits from savings in passenger time, is 12% as compared to the appraisal estimate of 17%. This confirms that the project is economically justified. One section of Vesturlandsvegur (VV4), however, has a significantly lower ER than estimated at appraisal due to 25% lower traffic volumes and a 50% increase in construction cost. The ER of 5% (excluding passenger time) indicates that improvement of this section should have been postponed. The construction cost of section VV4 amounts to 1Kr 130.4 million or 19% of total construction cost. Exclusion of section VV4 from the project would result in an ER of 13% (excluding passenger time) for the remaining sections included in the project.

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<sup>1/</sup> For the revised economic evaluation the actual costs of construction and supervision shown in Annex C were converted into 1974 prices on the basis of the construction price index for Iceland. The resulting costs of construction and supervision in 1974 prices are about 145% higher than those used in the economic evaluation of the Appraisal Report.

F. Project Costs and Disbursement

18. The summary of project costs is in Annex I and of disbursements in Annex J. The loan was fully disbursed by November 1973, about 19 months before the Closing Date of June 30, 1975 and 9 months before the date estimated at appraisal.

19. To accommodate the construction cost increases and permit disbursements to continue through the project period, the disbursement rate for Category I, road construction, was changed twice, for the first time from 50% to 45% (effective from January 1, 1972) and for the second time from 45% to 38% (effective from July 1, 1972).

20. The increased expenditure under Category III, road maintenance equipment, was covered by reallocations of US\$ 9,078.91 equivalent from Category IV, unallocated, and the remainder of Category IV (US\$ 583,921.09) was reallocated to Category I to partly offset the increase in construction costs.

G. Project Covenants and Negotiation Agreements

21. The main loan covenant required the Government to complete the construction of roads adjacent to project roads -- the first 2 km of Vesturlandsvegur and the middle sections of Sudurlandsvegur -- by the completion date of the project sections and to standards and specifications satisfactory to the Bank. The Government fully met the requirements. The Government also complied with the requirement to permit foreign contractors to employ foreign staff as reasonable required.

H. Conclusions

Economic Justification

22. The main benefits from road construction are savings in transport costs. The economic return of road construction is now estimated at 12%, exclusive of benefits from savings in passenger time, compared to an appraisal estimate of 17%. The overall economic feasibility of the project is therefore confirmed. The improvement of one section of the Vesturlandsvegur (VV4), however, should have been postponed.

23. Of the other benefits the following are worth mentioning:

- (i) since the PRA's policy is to use contractors in construction of all bigger road projects, the experiences in supervising the contracts and in settling the contractors' claims are

useful and will result in more precise contract documents in following contracts;

- (ii) the opportunity to participate in complete construction of modern highways was especially useful to local contractors who lacked related experience;
- (iii) the above mentioned also fully applies to the consultant; the experiences will result in lower supervision costs; and
- (iv) good results were gained in constructing new type lava embankments and low cost oil gravel pavements.<sup>1/</sup>

It is the PRA's opinion that these indirect benefits are significant and will result in better and more economical roads in future.

EMENA Regional Office  
October, 1974

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<sup>1/</sup> This is a process developed in Scandinavia in the 1950s. A special type of asphaltic oil is mixed with crushed gravel and the cold mixture is laid and compacted.



ICELAND  
FIRST HIGHWAY PROJECT  
LOAN 707-IC

Project Data and Background Information

1. Amount of Loan		US\$4,100,000
Amount Disbursed		
Category No. 1	US\$3,298,425.48	
Category No. 2	275,495.61	
Category No. 3	526,078.91	
Amount in Awarded Contracts		US\$6,630,000
Date of Loan Agreement		October 12, 1970
Effective Date		January 2, 1971
Closing Date		June 30, 1975
Dates and periods of supervision missions		1. May 31-June 4, 1971 2. June 5-9, 1972 3. July 3-6, 1973
Current Exchange Rate (November 1973)		US\$1.00 = 1 Kr. 83.60
Original Exchange Rate (September 1970)		US\$1.00 = 1 Kr. 88.00

2. The project comprises (a) the construction and improvement to two lane surfaced standards of approximately 14 km of the main route to the north and west (Vesturlandsvegur) and 33 km of the main southern route (Sudurlandsvegur) in the vicinity of Reykjavik; (b) supervision of (a); and (c) the purchase of specific items of highway maintenance equipment.

Construction and Supervision

3. Highway construction was divided into seven sections for bidding purposes. Two contracts were awarded in October 1970 to Icelandic firms and five contracts awarded in May 1970, two to Icelandic firms and three to an Icelandic/Danish joint venture.

4. Supervision of construction is by a local consulting organization (MATsf).

Main Covenants in Loan Agreement

5. The Government will complete the construction of: (i) the first 2 km of Vesturlandsvegur between Reykjavik and the sections to be constructed and improved; and (ii) the section of Sudurlandsvegur lying between the sections to be constructed and improved in accordance with standards and specifications satisfactory to the Bank.

ICELAND  
FIRST HIGHWAY PROJECT  
LOAN 707-IC

Progress of Construction

<u>Item</u>	<u>Section</u>	<u>Contractor</u>	<u>Length (km)</u>	<u>Starting Date</u>	<u>Due Completion Date</u>	<u>Date Completed</u>	<u>% Time Expired</u>
<u>Vesturlandsvegur</u>							
1	VV2	Adalbraut (Icelandic)	3.0	9/26/70	6/30/72	9/30/72	114
2	VV3	Thorisos ( " )	6.2	5/1/71	6/30/73	8/31/73	108
3	VV4	Thorisos ( " )	4.5	5/1/71	6/30/73	8/31/73	108
<u>Sudurlandsvegur</u>							
4	SV1	Istak/Pihl (Icelandic- Danish)	7.1	5/1/71	6/30/73	8/31/73	108
5	SV5	Istak/Pihl ( " )	6.3	5/15/71	6/30/73	7/31/73	104
6	SV6	Istak/Pihl ( " )	6.1	5/15/71	6/30/73	8/31/73	108
7	SV7 & 8	Thorisos (Icelandic)	<u>14.1</u>	10/1/70	6/30/73	8/20/73	109
			Total	47.3			

ICELAND  
FIRST HIGHWAY PROJECT  
LOAN 707-IC

Road Construction and Supervision Costs

	Appraisal Estimate			Final Cost <sup>1/</sup>	Change %
	Local	Foreign	Total	Total	
	----l Kr (millions)----			l Kr million	
I. <u>Road Construction and Improvement</u>					
1. <u>Contract Sections</u>					
Section VV2	32	32	64	58.6 <sup>2/</sup>	- 8
Section VV3	26	26	52	74.7 <sup>2/</sup>	+44
Section VV4	29	29	58	87.3 <sup>2/</sup>	+50
Section SV1	52	52	104	110.4 <sup>2/</sup>	+ 6
Section SV5	28	28	56	44.1 <sup>2/</sup>	-21
Section SV6	29	29	58	62.1 <sup>2/</sup>	+ 7
Section SV7 & 8	<u>40</u>	<u>40</u>	<u>80</u>	<u>57.6</u> <sup>2/</sup>	<u>-28</u>
Costs excluding quantity and price variations	236	236	472	494.8	+ 5
2. <u>Contingencies</u>					
Quantity Variations	}			75.7)	+117
Change Orders					
Price Escalation					
	<u>20</u>	<u>20</u>	<u>40</u>	<u>30.4</u> <u>77.0</u>	<u>+ 93</u>
Total Variations	44.5	44.5	89	183.1	+106
Total Costs Including Variations	280.5	280.5	561	677.9	+ 21
II. Consultants' Services for Supervision of Construction (including contingencies)	<u>30.5</u>	<u>30.5</u>	<u>61</u>	<u>51.7</u>	<u>- 15</u>
Total Costs	311	311	622	729.6	+ 17

<sup>1/</sup> There is no final breakdown into local and foreign costs. Because of the greater local input than estimated at appraisal, the foreign component is somewhat less than 50%.

<sup>2/</sup> Bid prices



Firm: MAT s/f, Reykjavík, Iceland

IBRD File: \_\_\_\_\_

C. F. Ref.: \_\_\_\_\_

**CONSULTING ENGINEER'S SUMMARY OF COMPLETED PROJECT**

1	Name of Project:	Iceland highway project																																																	
2.	Location of project:	Iceland: a) Reykjavík-Selfoss, SV-sections, 33.4 km																																																	
3.	Client:	PRA	b) Reykjavík-Kollafj. VV-sections, 13.8 km																																																
4.	Description of project:	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">a)</td> <td style="width: 15%;">section SV-1</td> <td style="width: 15%;">7.2 km, two lanes</td> <td style="width: 15%;">7.3 m with 10 cm</td> <td style="width: 45%;">Asph. concrete</td> </tr> <tr> <td>b)</td> <td>- SV-5,6,7,8,</td> <td>26.2 - - -</td> <td>- - -</td> <td>5 cm Oil-gravel</td> </tr> <tr> <td>c)</td> <td>- VV-2,3,4,</td> <td>13.8 - - -</td> <td>7.5 m -</td> <td>22 cm Cement concr.</td> </tr> </table>			a)	section SV-1	7.2 km, two lanes	7.3 m with 10 cm	Asph. concrete	b)	- SV-5,6,7,8,	26.2 - - -	- - -	5 cm Oil-gravel	c)	- VV-2,3,4,	13.8 - - -	7.5 m -	22 cm Cement concr.																																
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c)	- VV-2,3,4,	13.8 - - -	7.5 m -	22 cm Cement concr.																																															
5.	Description of professional services provided for this project:	<p>a) Preliminary Studies - None</p> <p>b) Detailed Engineering - a) Review of contract documents prior to tender b) Variations and additions of contract documents during construction together with PRA.</p> <p>c) Construction Supervision All, except material testing which were made by the government B.R.I.</p>																																																	
6:	Professional services provided for this project by others (if any):	<p>a) Description - a) Soils engineering, 0.5 man-months b) Asphalt paving " 0.5 " "</p> <p>b) Man-months provided by others - 1 (one)</p> <p>c) Others provided <u>0.3</u> % of all professional services required for this project</p>																																																	
7.	Completion time and project cost experience:	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2"></th> <th colspan="2">Consultant Services Contract</th> <th colspan="3">Firm's Project Cost Estimates at end of (a) and (b)</th> </tr> <tr> <th>Date Started</th> <th>Date Completed</th> <th>Base</th> <th>Contingencies</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>(a) Prelim. studies</td> <td>-</td> <td>-</td> <td>\$ PRA</td> <td>\$ PRA</td> <td>\$</td> </tr> <tr> <td>(b) Detailed engineering</td> <td>Sept. '70</td> <td>Mar. '74</td> <td>\$ "</td> <td>\$ "</td> <td>\$</td> </tr> <tr> <td colspan="6" style="text-align: center;">Actual Project Cost Experience</td> </tr> <tr> <td>(c) Est. duration of construction</td> <td colspan="2"><u>36 months</u></td> <td>Lowest Evaluated Bid</td> <td colspan="2">Total Final Cost</td> </tr> <tr> <td>(d) Actual construction period</td> <td colspan="2"><u>do</u></td> <td>\$ <u>5.78 mil.</u></td> <td colspan="2">\$ <u>7.92 mil.</u></td> </tr> <tr> <td colspan="6">(e) Explanation of Contingency Calculations in (a) and (b) above:</td> </tr> </tbody> </table>				Consultant Services Contract		Firm's Project Cost Estimates at end of (a) and (b)			Date Started	Date Completed	Base	Contingencies	Total	(a) Prelim. studies	-	-	\$ PRA	\$ PRA	\$	(b) Detailed engineering	Sept. '70	Mar. '74	\$ "	\$ "	\$	Actual Project Cost Experience						(c) Est. duration of construction	<u>36 months</u>		Lowest Evaluated Bid	Total Final Cost		(d) Actual construction period	<u>do</u>		\$ <u>5.78 mil.</u>	\$ <u>7.92 mil.</u>		(e) Explanation of Contingency Calculations in (a) and (b) above:					
	Consultant Services Contract		Firm's Project Cost Estimates at end of (a) and (b)																																																
	Date Started	Date Completed	Base	Contingencies	Total																																														
(a) Prelim. studies	-	-	\$ PRA	\$ PRA	\$																																														
(b) Detailed engineering	Sept. '70	Mar. '74	\$ "	\$ "	\$																																														
Actual Project Cost Experience																																																			
(c) Est. duration of construction	<u>36 months</u>		Lowest Evaluated Bid	Total Final Cost																																															
(d) Actual construction period	<u>do</u>		\$ <u>5.78 mil.</u>	\$ <u>7.92 mil.</u>																																															
(e) Explanation of Contingency Calculations in (a) and (b) above:																																																			

8. Comments on project cost experience:

a) Bids

On all 7 individual contracts, the employer received advantageous bids, underbids on sections SV-5/6 and VV-2, fair bids on sections SV-1 and SV-7/8 but on sections VV-3/4 the contractor made a fair profit.

b) Price variations

In case of great inflation full compensation is not given the contractor by rules as set out in cl. 70 of the CDs. During the construction period inflation is estimated 14% average per year. Actual paid price escalation was 8.5% against estimated 17-18% total addition for full adjustment. Certainly all that difference was not precalculated in the tender prices.

c) Total cost

		%
1) Tender	5.78 mil. \$	73.0
2) Increased quantities	0.88 "	11.1
3) Change orders	0.36 "	4.6
4) Price variations	0.62 "	7.8
5) Claims	0.28 "	3.5

7.92 mil. \$      100.0

9. Recommendations for future projects of similar type (e.g. lessons learned):

a) Preparation

Contract documents as prepared by the PRA proofed to be very satisfactory with exception of soil explorations. In future projects more effort should be spent on that item at the planning stage.

b) Contractors

All 3 contractors of the 7 sections were new in the road building field. To facilitate rapid progress in know-how and equipment more continuity in contract awarding is needed.

c) Supervision

Supervision cost of 7.7% of contract prices seems rather high, but would be reduced by more experience. For the '73 contracts, sections VV-5, RV-7/8, supervision cost is expected to be less than 5% of contract prices.

d) General policy

Within the total budgeting and general policy, as directed by the legislative body, more performance power should be delegated to the PRA.

Summary prepared by Baldur Jóhannesson  
(Name)

Res. Eng.  
Title

Baldur Jóhannesson  
Signature

Date 1974-02-27 Björn Ólafsson

Res. Eng.

Björn Ólafsson

ICELAND  
FIRST HIGHWAY PROJECT  
LOAN 707-IC

Highway Equipment Provided Under the Project

<u>Item No.</u>		<u>Appraisal No.</u>	<u>Estimate Cost US\$</u>	<u>Final No.</u>	<u>Procurement Cost US\$</u>
A.	<u>Equipment for maintenance of gravel roads</u>				
1.	Crushing, screening and loading plant	1	120,000	1	110,300
2.	Shovels	3	75,000	3 <sup>1/</sup>	84,300
3.	Motor Graders	7	<u>195,000</u>	6	<u>233,000</u>
	Sub-total		390,000		427,600
B.	<u>Equipment for snow clearing of surfaced roads</u>				
4.	Snow blower	1	19,000	2	46,264
5.	Wheel loaders	2	<u>61,000</u>	1	<u>28,100</u>
	Sub-total		80,000		74,364
6.	Spare Parts		47,000 (10%)		15,036
					<u>9,078.91</u> <sup>2/</sup>
	Total		517,000		526,078.91

<sup>1/</sup> With the Bank's concurrence the wheel loaders were substituted for the shovels.

<sup>2/</sup> US\$9,078.91 equivalent was allocated by the Bank from Category IV; unallocated in the Loan Agreement to Category III, Road maintenance equipment to offset the increased expenditure under that category. This increase is due to several acceptable increases in the final invoicing.

ICELAND  
FIRST HIGHWAY PROJECT

LOAN 707-IC

Average Annual Daily Traffic Volumes on Project Roads 1968-1992

Road Section	Appraisal Estimate						Revised Estimate					
	1968 1/	1973	1977	1982	1987	1992	1968 1/	1973 1/	1977	1982	1987	1992
<u>Vesturlandsvegur</u>												
VV2 - cars	2,700	4,348	5,916	8,066	10,393	12,275	2,700	3,150	4,286	5,736	7,321	8,907
trucks & buses	1,340	1,630	1,907	2,320	2,823	3,303	1,340	1,350	1,579	1,921	2,337	2,843
VV3 - cars	1,650	2,424	3,061	3,944	4,844	5,894	1,650	2,680	3,384	4,319	5,255	6,393
trucks & buses	818	995	1,164	1,417	1,723	2,097	818	1,320	1,544	1,879	2,286	2,781
VV4 - cars	970	1,425	1,799	2,318	2,848	3,465	970	1,020	1,288	1,644	2,000	2,433
trucks & buses	655	797	932	1,134	1,380	1,679	655	680	795	967	1,177	1,432
<u>Sudurlandsvegur</u>												
SV1 - cars	1,725	2,778	3,780	5,153	6,640	8,156	1,725	2,465	3,354	4,488	5,728	6,969
trucks & buses	345	440	535	657	800	973	345	435	529	644	784	954
SV5 - cars	850	1,249	1,577	2,032	2,495	3,036	850	1,445	1,824	2,328	2,832	3,446
trucks & buses	175	223	271	333	406	495	175	255	310	377	459	558
SV6 - cars	850	1,249	1,577	2,032	2,495	3,036	850	1,445	1,824	2,328	2,832	3,446
trucks & buses	175	223	271	333	406	494	175	255	310	377	459	558
SV7 - cars	920	1,352	1,707	2,199	2,701	3,286	920	1,530	1,932	2,466	3,000	3,650
trucks & buses	187	239	290	356	434	527	187	270	328	399	485	590
SV8 - cars	920	1,352	1,707	2,199	2,701	3,286	920	1,530	1,932	2,466	3,000	3,650
trucks & buses	187	239	290	356	434	527	187	270	328	399	485	590

1/ Actual

Source: Public Roads Administration and Mission Estimates.



ICELAND  
FIRST HIGHWAY PROJECT  
LOAN 707-IC  
Vehicle Operating Costs  
(TKr per km)

Representative Vehicle	Appraisal Estimate								Revised Estimate <sup>1/</sup>							
	VV 2	VV 3	VV 4	SV 1	SV 5	SV 6	SV 7	SV 8	VV 2	VV 3	VV 4	SV 1	SV 5	SV 6	SV 7	SV 8
<b>A. Passenger Car:</b>																
a. <u>Excluding Passenger Time</u>																
Existing Road	3.65	3.65	3.69	3.65	4.09	4.62	3.92	3.27	8.56	8.56	8.66	8.56	9.60	10.84	9.20	7.67
New Road	<u>3.02</u>	<u>3.03</u>	<u>3.05</u>	<u>3.03</u>	<u>3.25</u>	<u>3.55</u>	<u>3.24</u>	<u>3.02</u>	<u>7.08</u>	<u>7.11</u>	<u>7.16</u>	<u>7.11</u>	<u>7.62</u>	<u>8.33</u>	<u>7.60</u>	<u>7.08</u>
Saving	<u>0.63</u>	<u>0.62</u>	<u>0.64</u>	<u>0.62</u>	<u>0.84</u>	<u>1.07</u>	<u>0.68</u>	<u>0.25</u>	<u>1.48</u>	<u>1.45</u>	<u>1.50</u>	<u>1.45</u>	<u>1.98</u>	<u>2.51</u>	<u>1.60</u>	<u>0.59</u>
% Saving	17%	17%	17%	17%	21%	23%	17%	8%	17%	17%	17%	17%	21%	23%	17%	8%
b. <u>Including Passenger Time</u>																
B Existing Road	5.11	5.11	5.15	5.11	5.79	6.48	5.38	4.53	12.61	12.61	12.71	12.61	14.28	15.99	13.27	11.18
New Road	<u>4.14</u>	<u>4.15</u>	<u>4.17</u>	<u>4.15</u>	<u>4.37</u>	<u>4.75</u>	<u>4.36</u>	<u>4.14</u>	<u>10.21</u>	<u>10.24</u>	<u>10.29</u>	<u>10.24</u>	<u>10.78</u>	<u>11.72</u>	<u>10.76</u>	<u>10.21</u>
Saving	<u>0.97</u>	<u>0.96</u>	<u>0.98</u>	<u>0.96</u>	<u>1.42</u>	<u>1.73</u>	<u>1.02</u>	<u>0.39</u>	<u>2.40</u>	<u>2.37</u>	<u>2.42</u>	<u>2.37</u>	<u>3.50</u>	<u>4.27</u>	<u>2.51</u>	<u>0.97</u>
% Saving	19%	19%	19%	19%	25%	27%	19%	9%	19%	19%	19%	19%	25%	27%	19%	9%
<b>B. Heavy Vehicle:</b>																
Existing Road	14.87	14.79	15.41	14.79	17.84	22.97	19.34	12.45	33.95	33.77	35.18	33.77	40.73	52.44	44.15	28.42
New Road	<u>10.17</u>	<u>10.37</u>	<u>10.71</u>	<u>10.30</u>	<u>11.53</u>	<u>14.37</u>	<u>11.45</u>	<u>10.23</u>	<u>23.22</u>	<u>23.67</u>	<u>24.45</u>	<u>23.51</u>	<u>26.32</u>	<u>32.81</u>	<u>26.14</u>	<u>23.36</u>
Saving	<u>4.70</u>	<u>4.42</u>	<u>4.70</u>	<u>4.49</u>	<u>6.31</u>	<u>8.60</u>	<u>5.89</u>	<u>2.22</u>	<u>10.73</u>	<u>10.10</u>	<u>10.73</u>	<u>10.26</u>	<u>14.51</u>	<u>19.63</u>	<u>18.01</u>	<u>5.06</u>
% Saving	32%	30%	30%	30%	35%	37%	30%	18%	32%	30%	31%	30%	36%	37%	41%	18%

<sup>1/</sup> Average vehicle operating cost increase 1970-74: Passenger cars excluding passenger time: 135%; passenger cars including passenger time: 147%; heavy vehicles: 128%

Source: Transport Survey, Economic Institute and Mission Estimates.

ICELAND  
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LOAN 707-IC

Rates of Return of Project Road Sections <sup>1/</sup>  
 (%)

<u>Road Section</u>	<u>Appraisal Estimate</u>		<u>Revised Estimate</u>	
	<u>Excluding Passenger Time</u>	<u>Including Passenger Time</u>	<u>Excluding Passenger Time</u>	<u>Including Passenger Time</u>
<u>Total</u>	<u>17</u>	<u>20</u>	<u>12</u>	<u>14</u>
<u>Vesturlandsvegur</u>	<u>22</u>	<u>25</u>	<u>12</u>	<u>14</u>
VV2	18	21	13	15
VV3	24	27	18	21
VV4	25	28	5	6
<u>Sudurlandsvegur</u>	<u>14</u>	<u>17</u>	<u>12</u>	<u>15</u>
SV1	11	14	11	14
SV5	15	19	11	14
SV6	16	20	11	14
SV7 + SV8	12	15	14	16

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<sup>1/</sup> Most likely and/or actual values of investment, vehicle operating costs and traffic growth.

ICELAND  
FIRST HIGHWAY PROJECT  
Loan 707-IC

Summary of Costs, Loan Allocations and Disbursements

<u>Category</u>	-----Costs-----				<u>Loan Allocation (US\$)</u>	<u>Disbursed (US\$)</u>
	<u>Appraisal Estimate</u>		<u>Actual</u>			
	<u>l Kr</u>	<u>US\$</u>	<u>l Kr</u>	<u>US\$</u>		
1. Road Construction and Improvement	561,000,000	6,350,000	677,900,000	7,920,000	2,690,000	3,298,425.48
2. Consultants' Services for Supervision of Construction	61,000,000	770,000	51,700,000	604,006	300,000	275,495.61
3. Road Maintenance Equipment Including Spare Parts	48,000,000	540,000	46,000,000 <sup>1/</sup>	526,000	517,000	526,078.91
4. Unallocated					593,000	
<b>Total</b>	<b>670,000,000</b>	<b>7,660,000</b>	<b>775,600,000</b>	<b>9,050,000</b>	<b>4,100,000</b>	<b>4,100,000.00</b>

<sup>1/</sup> Estimate

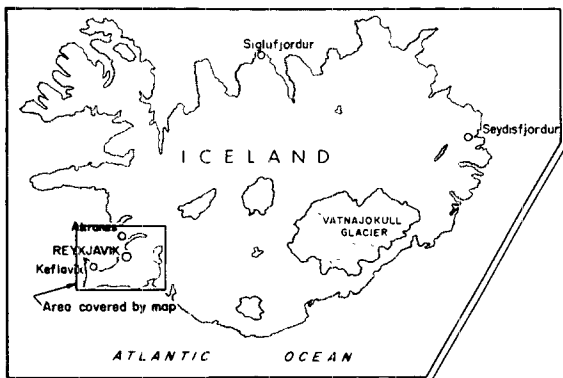
ICELANDLoan 707-ICDISBURSEMENTS

IBRD/IDA FISCAL YEAR AND QUARTER	ACCUMULATED DISBURSEMENTS IN THOUSANDS OF US\$ EQUIVALENT		ACTUAL DISBURSEMENTS AS A PERCENTAGE OF APPRAISAL ESTIMATE (UP TO LATEST QUARTER) OR NEW ESTIMATE OF DISBURSEMENTS AS A PERCENTAGE OF APPRAISAL ESTIMATE (FOR FUTURE QUARTERS) (1+2) x 100 or (4+2) x 100
	ACTUAL TOTAL DISBURSEMENTS	APPRAISAL ESTIMATE	
1970/71			
1st			
2nd			
3rd	309	160	193%
4th	752		
1971/72			
1st	1,832	1,180	155%
2nd	2,302		
3rd	2,572	2,075	123%
4th	2,834		
1972/73			
1st	3,412	2,890	118%
2nd	3,836		
3rd	3,931	3,310	118%
4th	3,995		
1973/74			
1st	4,062	3,750	108%
2nd	4,100		
3rd		3,980	
4th			
1974/75			
1st		4,100	

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Closing Date June 30, 1975

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## ICELAND HIGHWAY PROJECT

- MAIN ROADS
- PROJECT ROAD SECTIONS
- - - PRA ROAD SECTIONS

