



# ROADEX

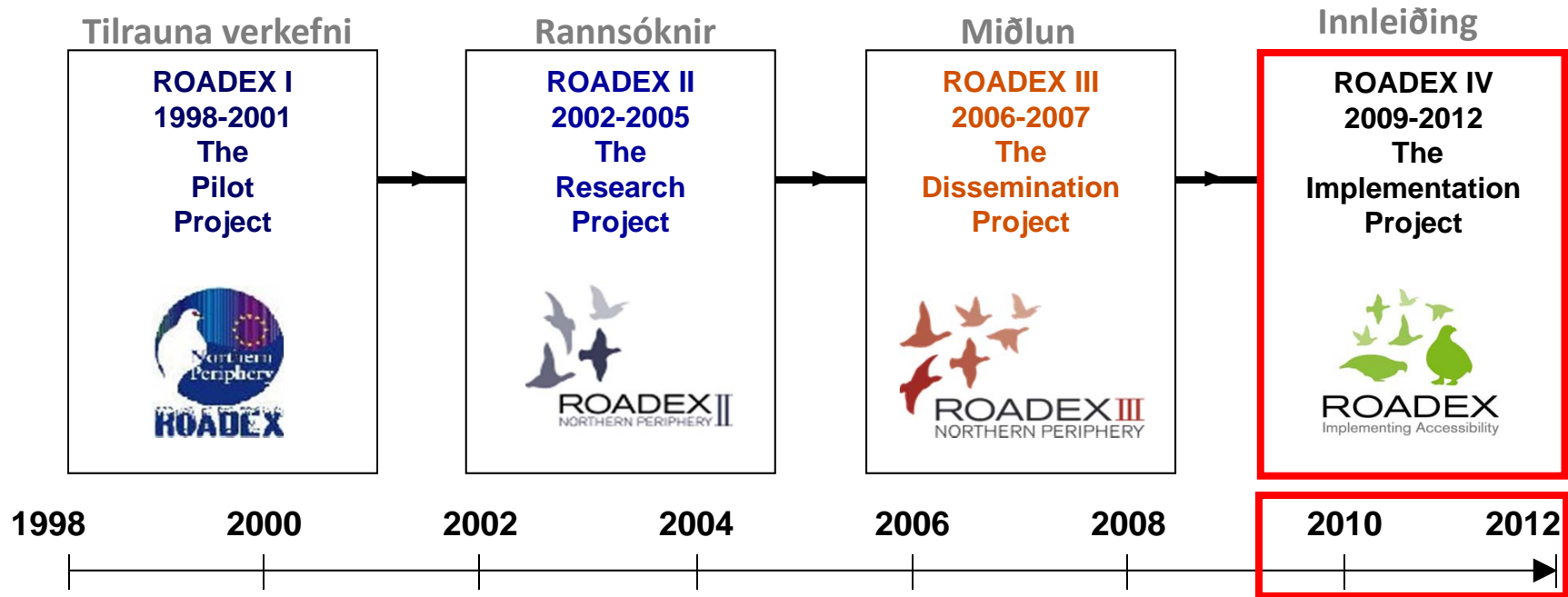
Rannsóknarráðstefna  
Vegagerðarinnar í Hörpu  
9. nóvember 2012

## Innleiðing

Haraldur Sigursteinsson  
Vegagerðarin,  
Veghönnunardeild

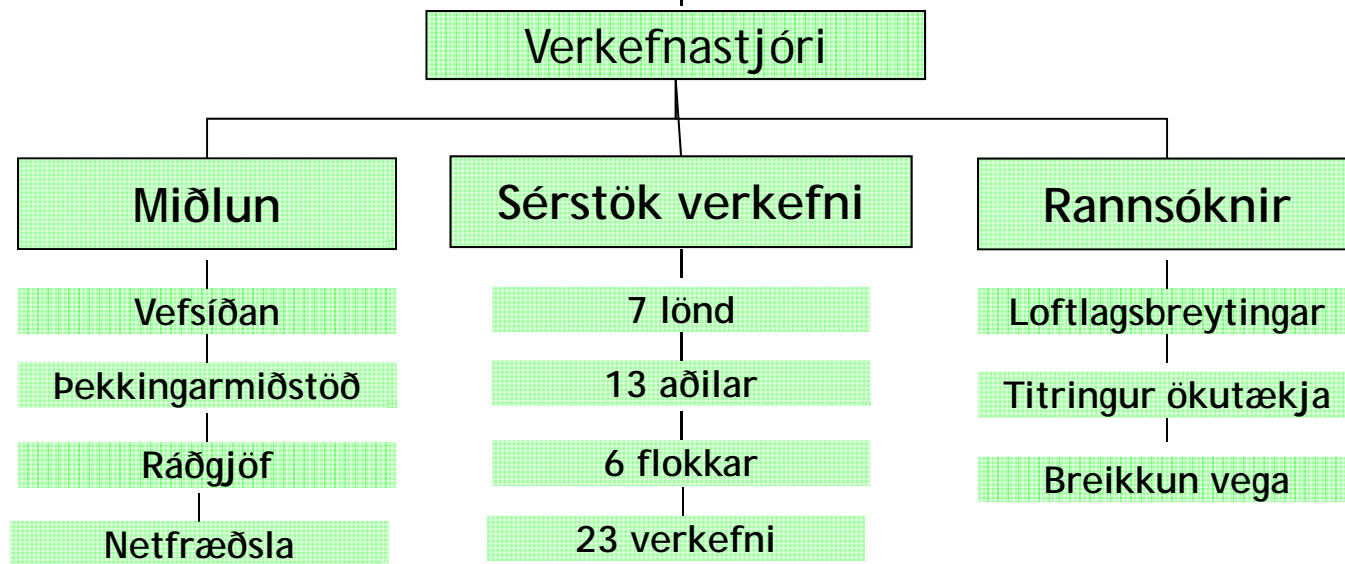


# ROADEX 1998 - 2012:





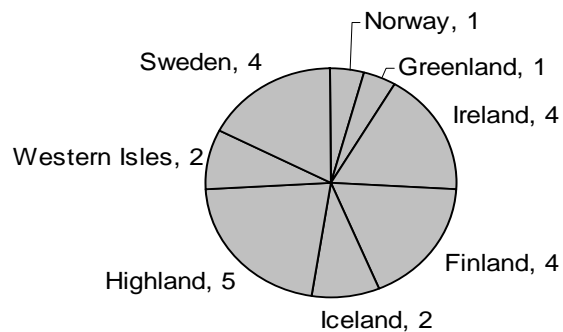
# Uppbygging ROADEX IV



[www.roadex.org](http://www.roadex.org)

## Sérstök verkefni

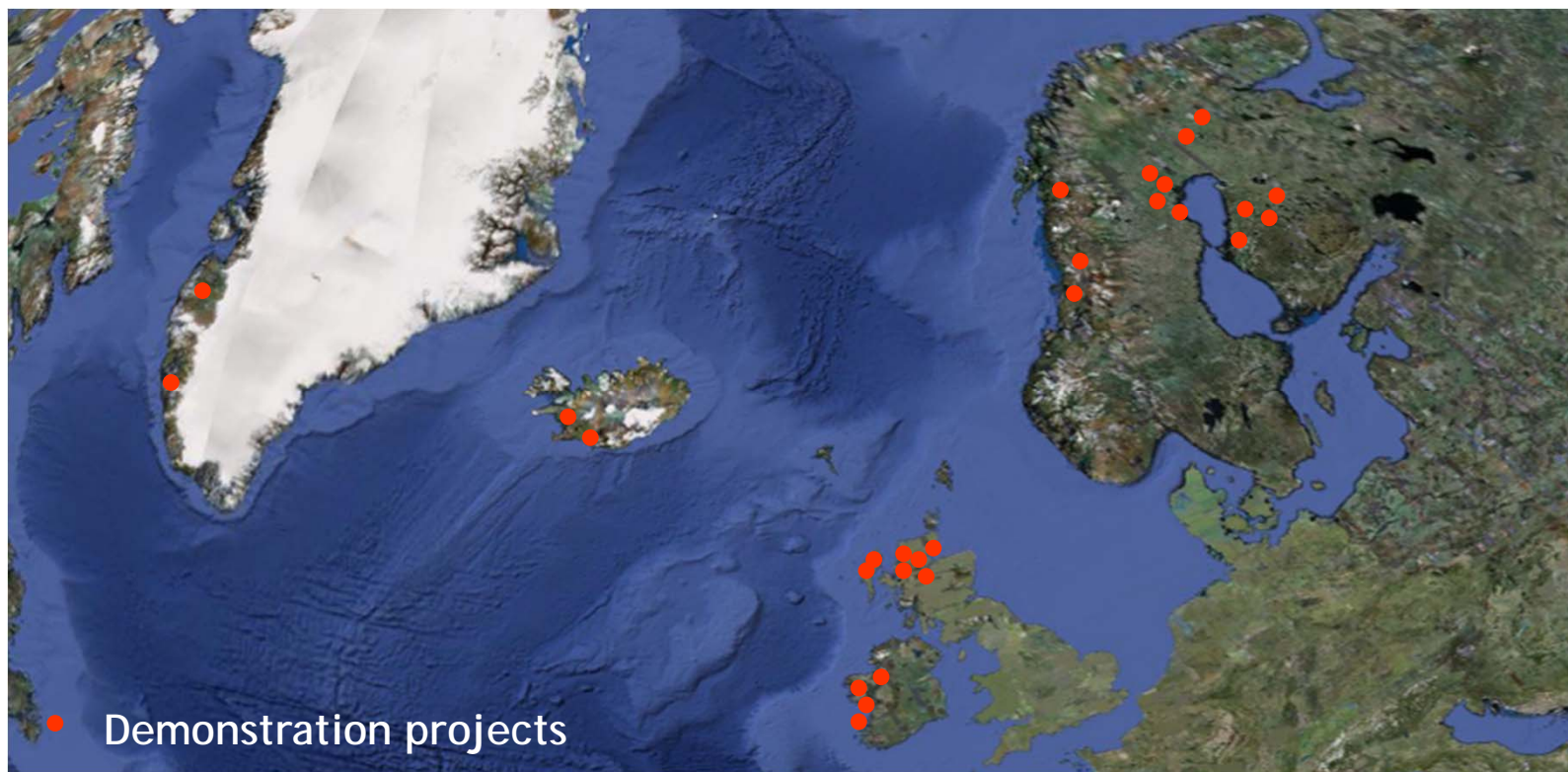
- 7 lönd
- 13 aðilar
- 6 efnisflokkar
- 23 verkefni +



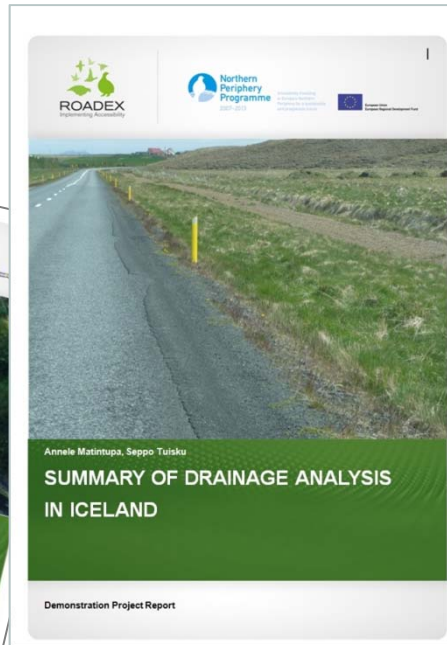
## Skipting milli aðila

No	Location	Description
1	Greenland	Drainage maintenance guidelines - to be managed by Dr Timo Saarenketo of Roadscanners Oy, author of the ROADEX drainage reports
2	Ireland	
3	Finland	
4	Iceland	
5	Highland	
6	Western Isles	
7	Sweden	
8	Finland	Road friendly vehicles and CTI - to be managed by Professor Pauli Kolisoja of the Tampere University of Technology, author of the ROADEX report on permanent deformation.
9	Highland	
10	Sweden	
11	Ireland	Forest Road management and maintenance policies - to be managed by Svante Johansson of Roadscanners AB, author of the ROADEX reports and policies on the socio-economic impacts of low volume roads.
12	Highland	
13	Sweden	
14	Finland	Rutting, from theory to practice - to be managed by Professor Pauli Kolisoja of the Tampere University of Technology, author of the ROADEX report on permanent deformation.
15	Iceland	
16	Highland	
17	Western Isles	
18	Sweden	
19	Kerry	Roads on Peat - to be managed by Ron Munro of Munroconsult Ltd, author of the ROADEX reports on roads constructed on peat.
20	Donegal	
21	Finland	Analysis of health problems due to vibration - to be managed Johan Granlund, Vectura Consulting AB, author of the ROADEX III Task B report "Health Issues Raised by Poorly Maintained Road Networks"
22	Norway	
23	Highland	

## Sérstök ROADEX kynningar verkefni



# ROADEX staða útgáfu Nóvember 2012:



	Group	Report	Status
1	Drainage	Drainage analysis, N56, Donegal, Ireland	Published
2	Drainage	Drainage analysis, N59, Mayo, Ireland	Published
3	Drainage	Drainage analysis, Western Isles, Scotland	Published
4	Drainage	Drainage analysis, Highland, Scotland	Published
5	Drainage	Drainage analysis, Nuuk, Greenland	Published
6	Drainage	Drainage analysis, Sisimiut, Greenland	Published
7	Drainage	Drainage analysis, Iceland	Published
8	Drainage	Drainage analysis, Umeå Södra, Region Norr, Sweden	Published
9	Drainage	Use of laser scanning and thermal cameras, Sweden	Published
10	Drainage	Drainage analysis, Norway	Published
11	Drainage	Rovaniemi drainage update (in Finnish)	Published
12	Drainage	Kittilä drainage update (in Finnish)	Published
13	Drainage	ROADEX IV drainage follow up Kittilä and Rovaniemi	Published
14	TPCS	Ground pressure demonstration, Scotland	Published
15	TPCS	Traction demonstration, Niinisaari and Ivalo, Finland	Published
16	Forest roads	Timmerleden forest road, Sweden	Published
17	Forest roads	Gleann Mor forest road, Scotland	Published
18	Forest roads	Glenfiddich forest road, Scotland	Published
19	Forest roads	Derrydonnell forest road, Ireland	
20	Design	Lined ditch and slope, Finland	Published
21	Design	Trench drain and slope protection, Finland	Published
22	Design	Geo-reinforcement on a peat subgrade, Finland	Published
23	Design	Geo-reinforcement on a silty subgrade, Finland	Published
24	Design	Homogenization and coarsening a road structure, Finland	Published
25	Design	Rehabilitation demonstrations, Norway	With author
26	Design	ROADEX road design methodology for Mode 1 & Mode 2 rutting	With author
27	Design	Road 582 Selet-Boden, steel grids	Published
28	Design	Road 582 Selet-Boden, additional layers	Published
29	Design	Road 582 Selet-Boden, partial replacement + additional material	Published
30	Design	Road AC 1093 Morkan - Dikanäs, Västerbotten, Sweden	Published
31	Roads on peat	N56 risk analysis, Co Donegal, Ireland	Published
32	Roads on peat	N59 risk analysis, Co Mayo, Ireland	Published
33	Vibration and health	Vehicle and human vibration due to road condition	Under review
34	ROADEX applications	Pajala Mine Road, Sweden	Published
35	ROADEX applications	ROADEX in Ireland	Published
36	ROADEX applications	ROADEX benefits	With authors
37	Research	Climate change adaptation	Published
38	Research	Road widening - review	Published
39	Research	Road widening - case histories	Published
40	Research	Road widening - guidelines	Published

# ROADEX staða útgáfu Nóvember 2012:



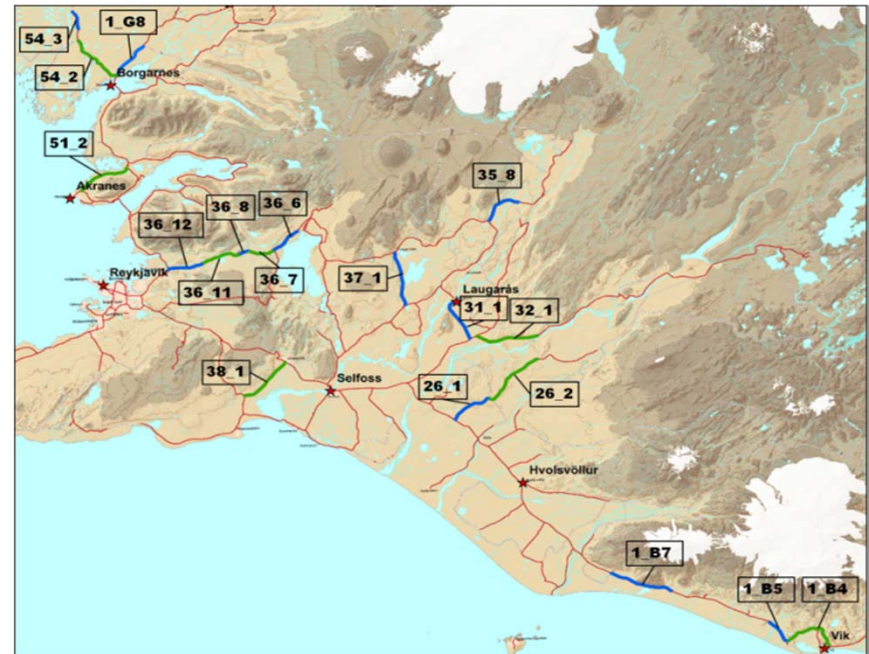
<b>Greining afvötnunar</b>	13
Lofþrýstingsstjórnun	2
Skógarvegir	4
<b>Hönnun – formbreytingar</b>	11
<b>Vegir um mýrlendi</b>	2
<b>ROADEX sérverkefni</b>	3
Titringur og heilsa	1
Aðlögun loftlagsbreytinga	1
<b>Breikkun vega</b>	3



## GREINING AFVÖTNUNNAR

Gerð var úttekt á um 175 km af vegum og eru þessir kaflar sýndir á meðfylgjandi mynd.

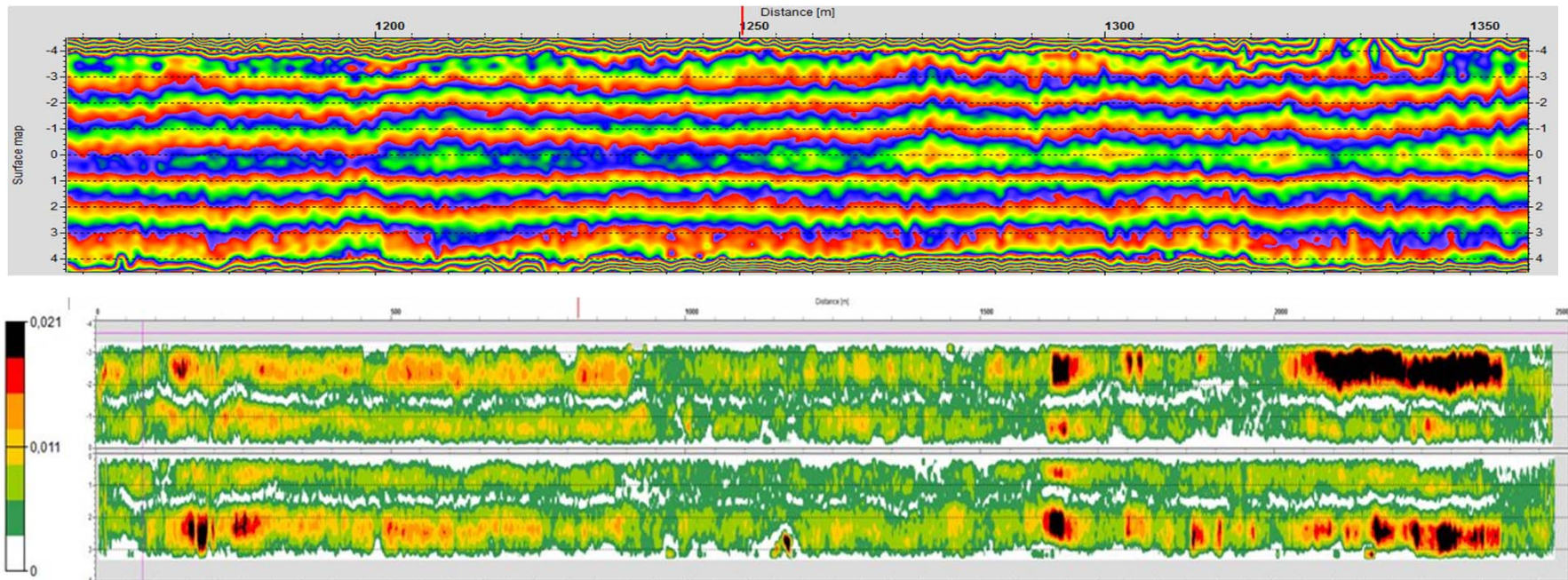
Sérstaklega var óskað eftir vegum þar sem afvötnun var talin ábótavant.



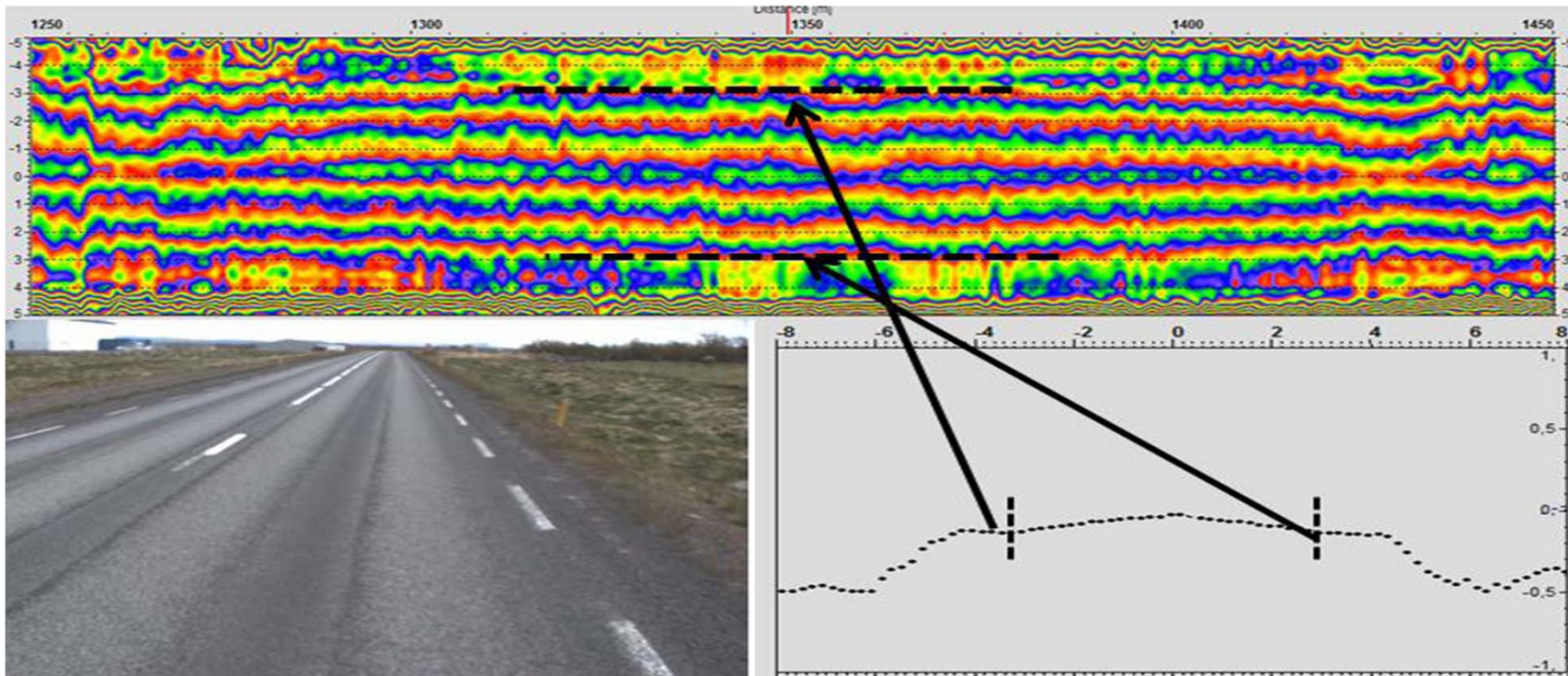
Bifreið Vegagerðarinnar var útbúin sérstaklega fyrir verkefnið. Smíðaður var rammi fyrir laserskannann og var hann staðsettur aftan á bílnum í um 3 m hæð frá jörðu.

## Við úrvinnsluna er notaður hugbúnaðurinn Road Doctor

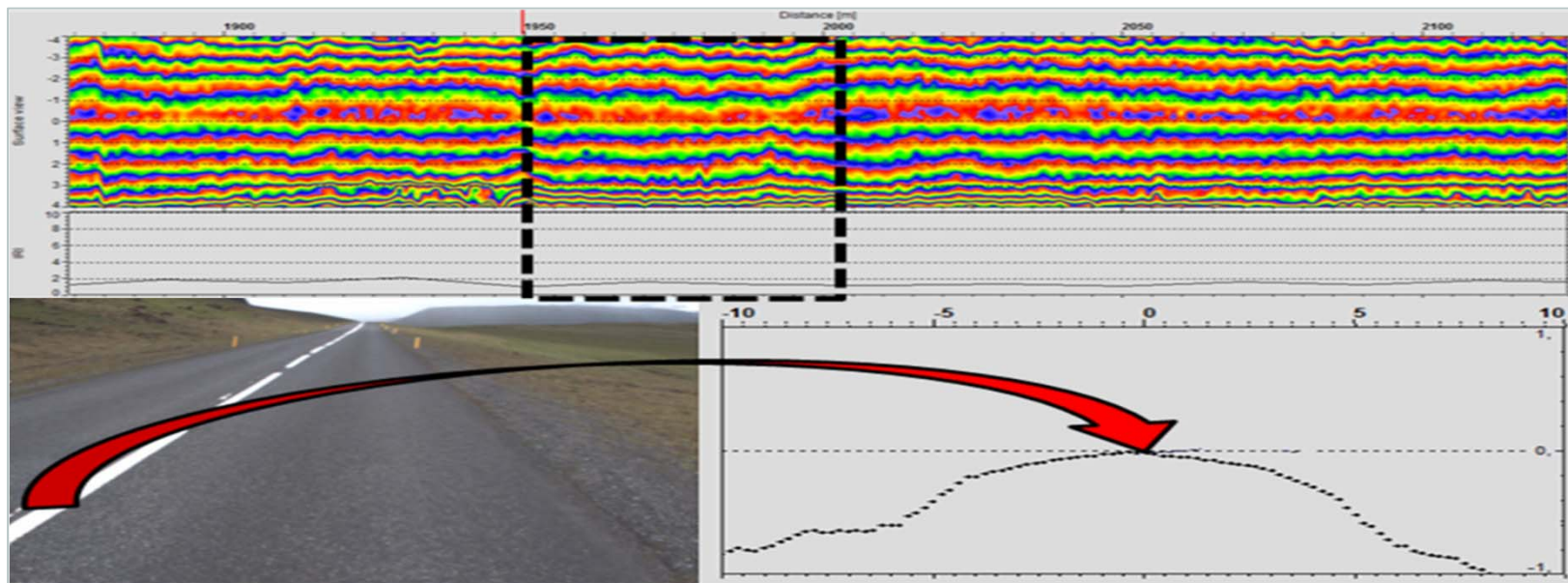
Regnbogakort er teiknað af yfirborði vegarins, hér er góður rishalli á veginum en litaskipti verða við hverja 40 mm í hæðarbreytingu.



Vesturlandsvegur ofan við Borgarnes. Hjólför við axlir koma fram sem breiðir fletir á regnbogalínuritinu.



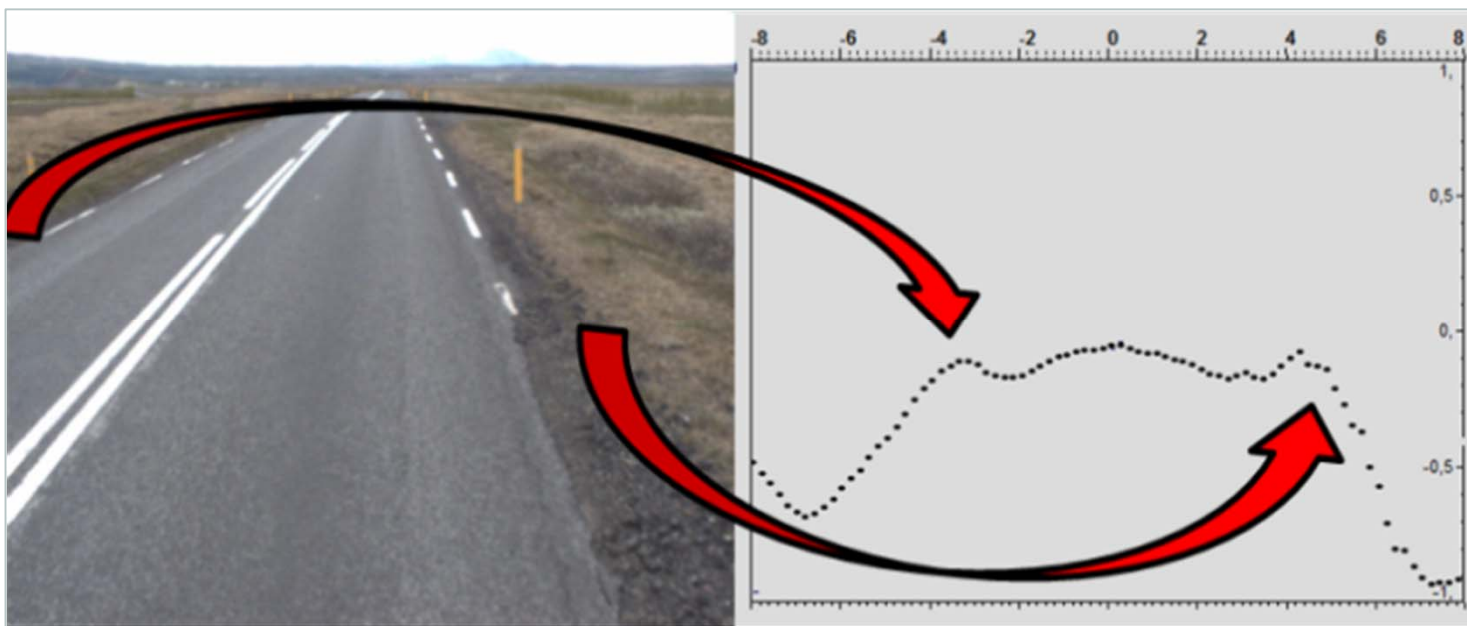
Regnbogakortið er notað til úrvinnslu ásamt myndum og þversniðsteikningum sem gerðar eru út frá lasermælingunum.



Dæmi um veg á Suðurlandi með góðum rishalla .

Það voru ekki allir vegir vel krýndir.

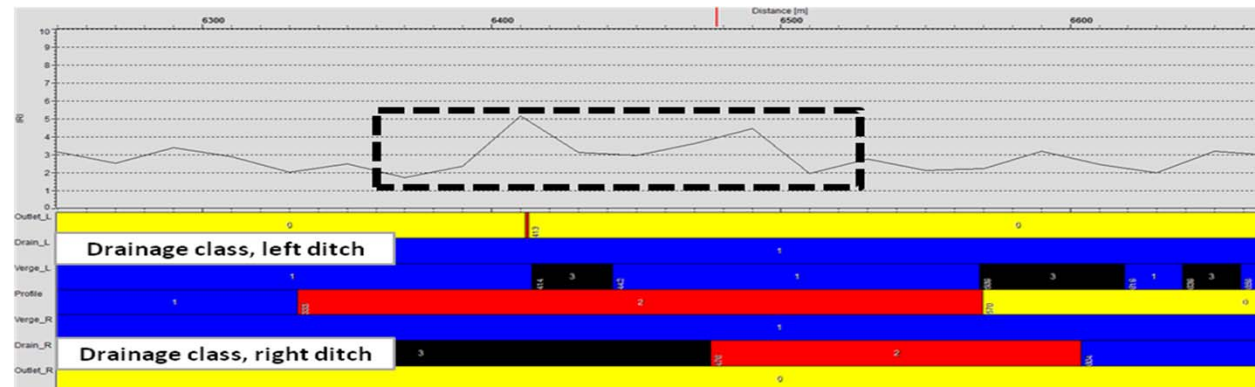
Helstu athugasemdir sem koma fram í úttektinni voru vegna rása og hárra kanta.





Grunn vegrás og uppgróin axlarbrún, tvær ástæður fyrir því að vatn leitar inn í veginn.

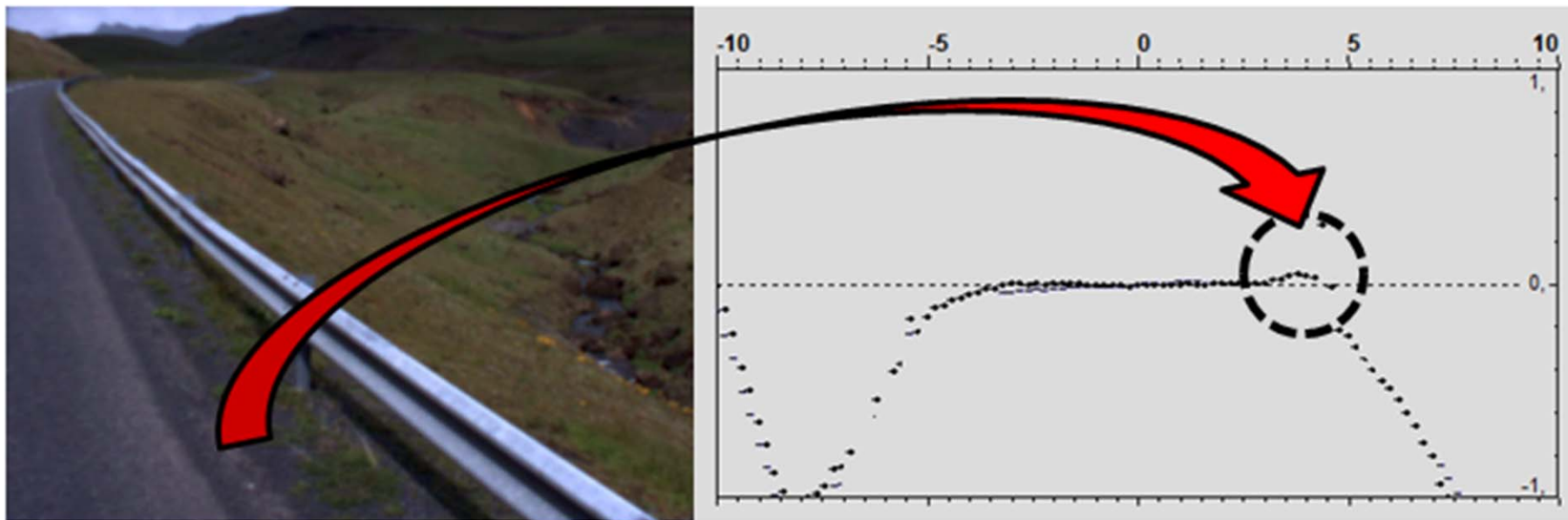
Skurðir fullir af vatni og gróðri geta haft áhrif á sléttleika



Vegkaflinn lendir í afvötnunarflokki 3 og hefur talsverð áhrif á sléttleikann sbr. hækkun á IRI gildi.

Röst undir vegriði

Verður til þess að vatn leitar inn í burðarlagið.

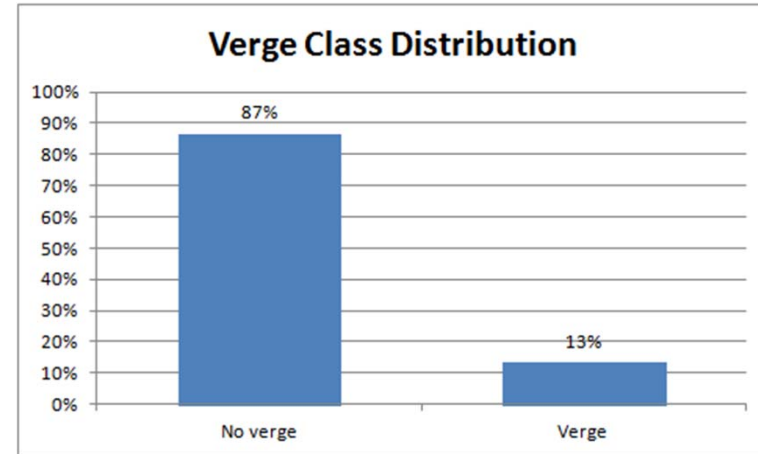
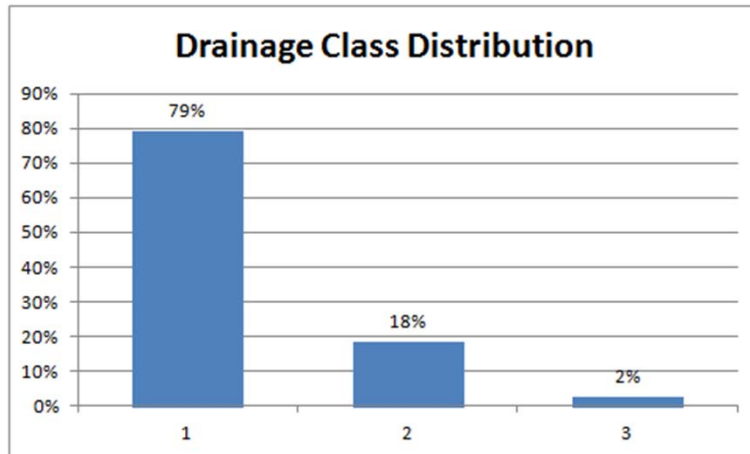


## Niðurstaða greiningar á 175 km:

Meirihluti vega í greiningunni var byggður á fyllingu eða 57% sem er hærra hlutfall en hjá öðrum.

Afvötnun er flokkuð í þrjá flokka: 1 – góð, 2 – ásættanleg og 3 – léleg.

Rastir á vegöxlum eru flokkaðar í tvo flokka: 1 – engar rastir, 2 – röst er til staðar.



Miðað við afvötnun lendir verulegur meirihluti í flokki 1 eða 79% og rastir á köntum eru á 13% þeim vegum sem voru mældir.

„This leads to a conclusion that the **drainage condition** in Iceland was on average at an **excellent** level compared to the other ROAD EX drainage demonstration projects.“



Við vorum bara stoltir af okkar útfærslu

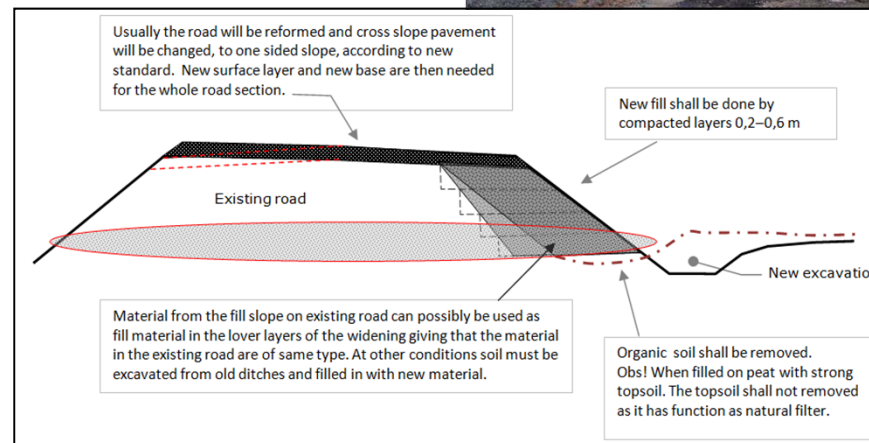


**Everyman's RDLS Laser scanner survey vehicle (left)**  
and a high precision Quantum 3D laser scanner survey vehicle (right) used in ROADEX surveys

## BREIKKUN VEGA

Fyrirliggjandi eru þrjár ROADEX skýrslur um breikkun vega.

- Stöðukönnun hjá aðildarlöndum.
- Vettvangsrannsóknir og mat á breikkunum.
- Viðmiðunarreglur við gerð breikkana.



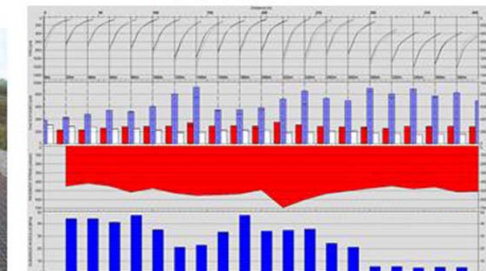
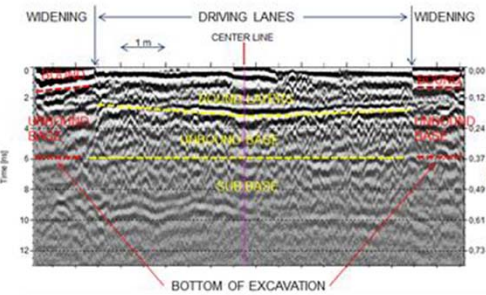
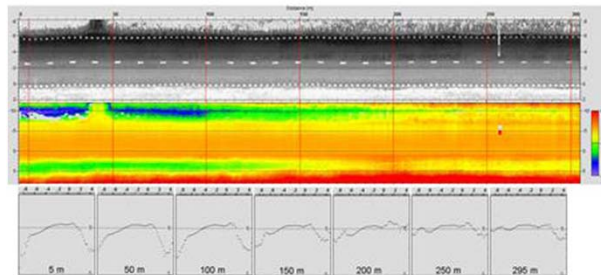
Út frá svörum í könnun var tekið saman yfirlit um verklag frá öllum aðildarlöndunum.

## BREIKKUN VEGA - 2

Vettvangsrannsóknir og mat á gömlum breikkunum.

Við úttekt var m.a. notast við;

- 3d GPR mælitækni og
- háskerpu IR mælingar



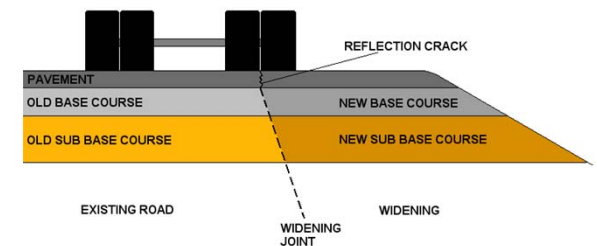
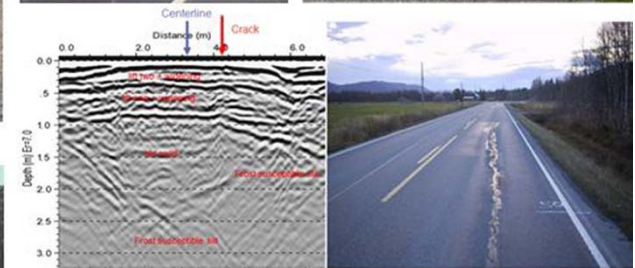
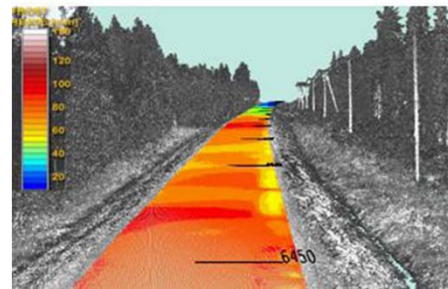
## BREIKKUN VEGA - 3

Viðmiðunarreglur við gerð breikkana.

Fjallað er um undirbúning, hönnun og uppbyggingu.

Einsleitni einstakra laga í veginum.  
Álag frá umferð.  
Gerð og staðsetningu samsetningar.  
Frágang fláa.

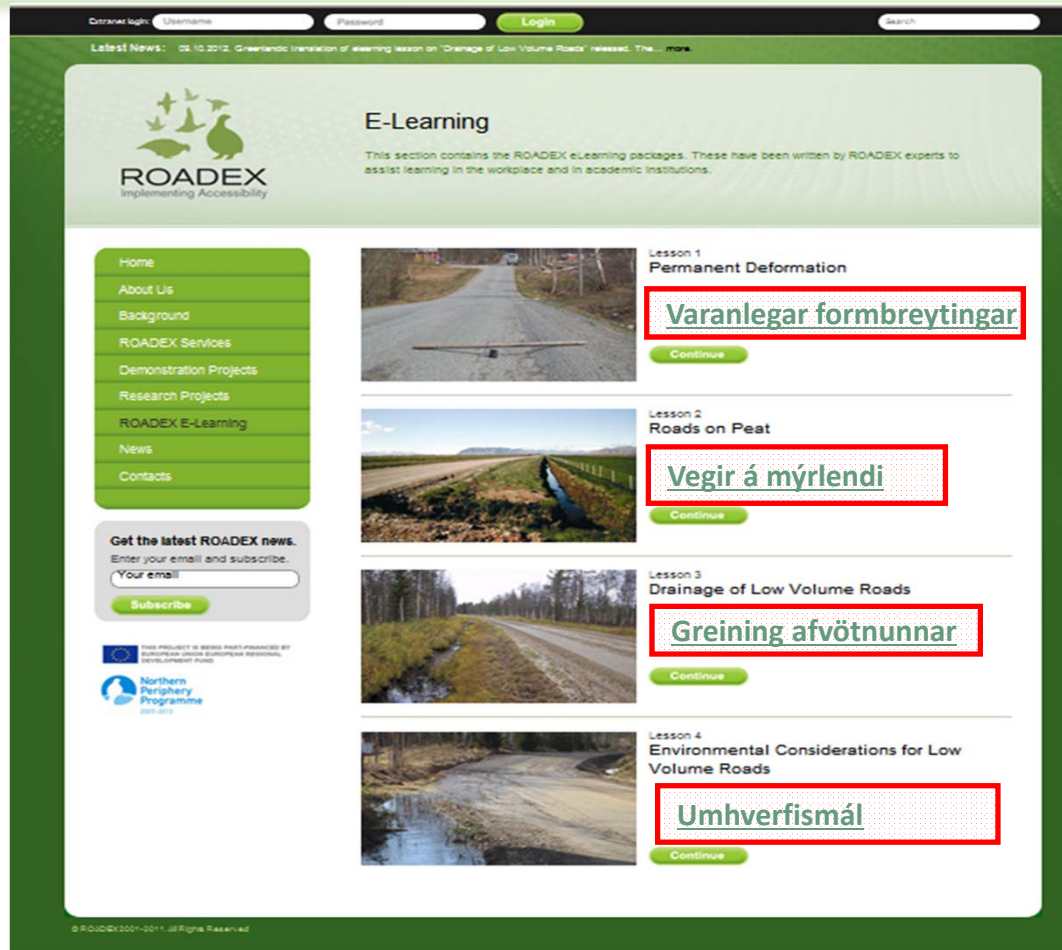
Áhersla er lögð á að breikkunin sé hvorki veikari eða sterkari en aðrir hlutar vegarins og að ekki sé mismunur á frostnæmi einstakra laga í uppbyggingunni.



## E-Learning Netfræðsla

Unnið hefur verið námsefni í fjórum efnisflokku.

Markmiðið er að öll netfræðslukerfin verði þýdd á tungumál aðildarlandanna.



The screenshot shows the ROADEX E-Learning website. At the top, there is a navigation bar with fields for 'Username', 'Password', and 'Login', along with a search bar. Below this, a 'Latest News' section displays a date and a link to a news item. The main content area is titled 'E-Learning' and includes a sub-header: 'This section contains the ROADEX eLearning packages. These have been written by ROADEX experts to assist learning in the workplace and in academic institutions.' On the left side, there is a vertical menu with links to 'Home', 'About Us', 'Background', 'ROADEX Services', 'Demonstration Projects', 'Research Projects', 'ROADEX E-Learning', 'News', and 'Contacts'. Below the menu is a 'Get the latest ROADEX news.' section with an email input field and a 'Subscribe' button. At the bottom left, there is a logo for the 'Northern Periphery Programme' with the text 'THIS PROJECT IS BEING PART-FINANCED BY EUROPEAN UNION EUROPEAN REGIONAL DEVELOPMENT FUND'. The main content area features four lesson cards, each with a photo and a title in Icelandic, highlighted with a red box: 'Lesson 1 Permanent Deformation' with the title 'Varanlegar formbreytingar', 'Lesson 2 Roads on Peat' with 'Vegir á mýrlandi', 'Lesson 3 Drainage of Low Volume Roads' with 'Greining afvötnunnar', and 'Lesson 4 Environmental Considerations for Low Volume Roads' with 'Umhverfismál'. Each card also has a 'Continue' button. At the bottom of the page, there is a copyright notice: '© ROADEX 2007-2011. All Rights Reserved.'

# Dæmi um unnin verkefni:



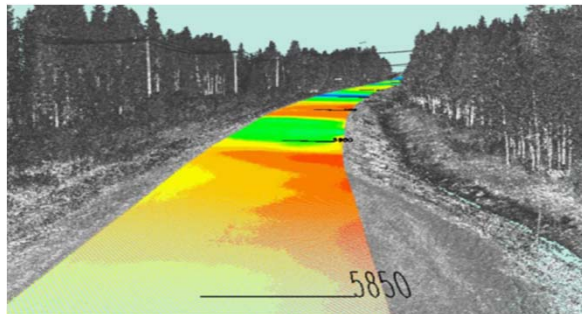
**Trialing methods to minimise permanent deformation on peat**



**Improving the ROADDEX road design methodology with new data**



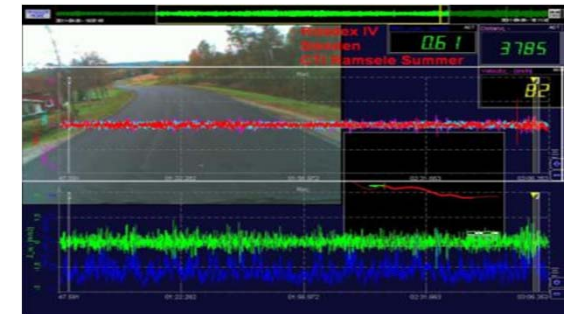
**Monitoring the benefits of TPCS on timber haulage vehicles**



**Using laser scanning and point cloud technology in frost heave analysis**



**Demonstrating ROADDEX drainage surveys and analysis**



**Measurements of vibration in vehicles and drivers**

## Dæmi um unnin verkefni: demonstrations of design against rutting (2)

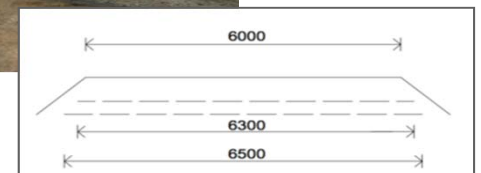
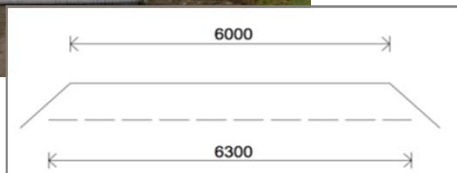
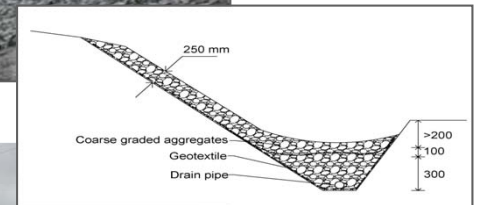
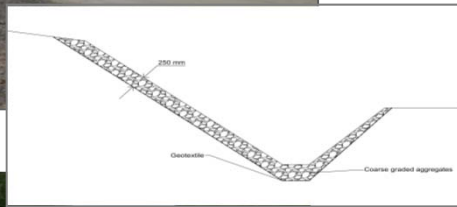
Coarsening of a roadbase by stone crushing



Steinbrjótur á Írlandi

# Dæmi um unnin verkefni: demonstrations of design against rutting

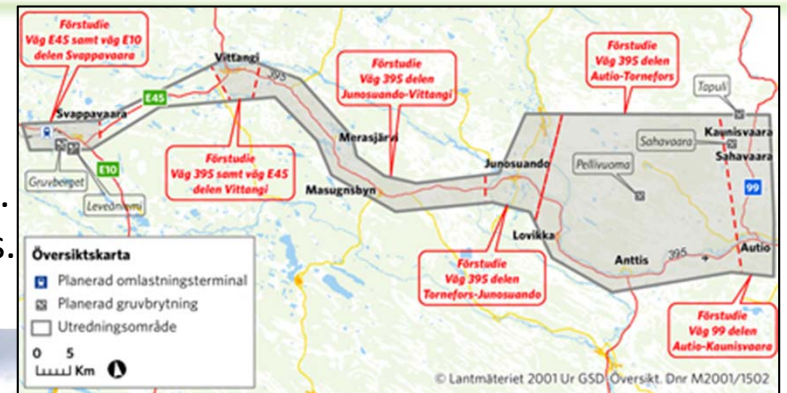
(Tampere University of Technology)





## PAJALA námuvegurinn

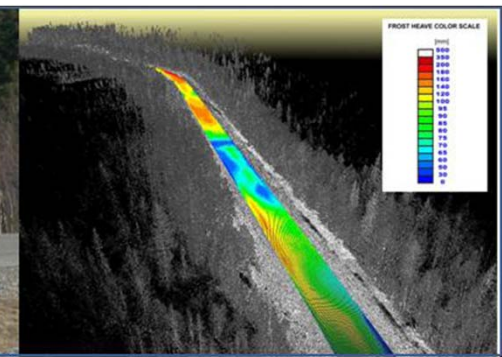
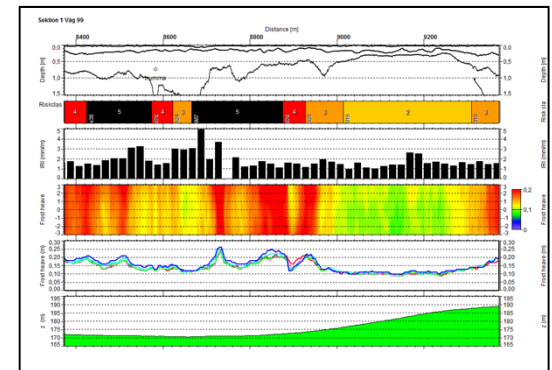
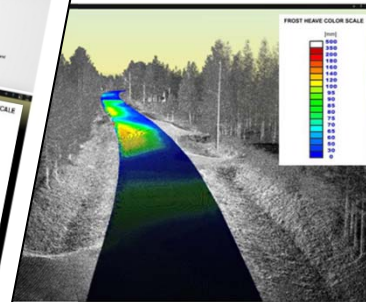
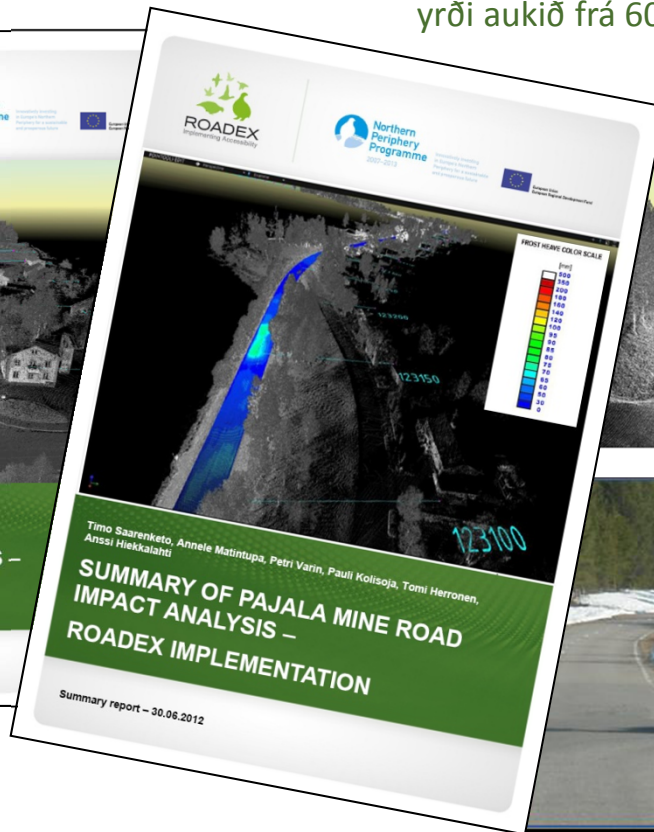
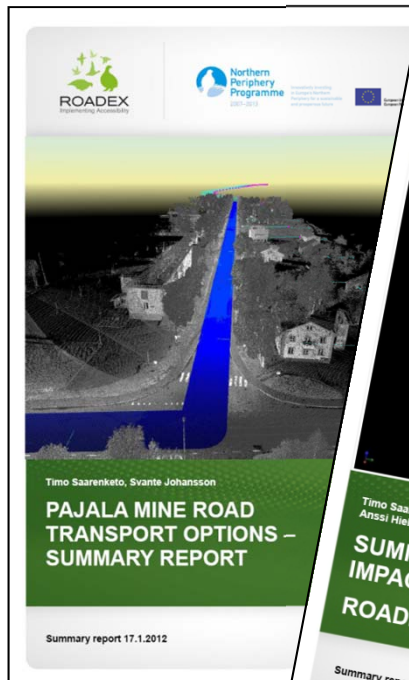
Um 150 km námuvegur í Norðurbotni Svíþjóðar.  
Fimm milljón tonn af málmgrýti á ári um venjulega þjóðvegi.  
60 tonna trukkar á 5 mínúta bili 24 tíma/dag alla daga ársins.



**90 tonna vagnlestir, 7 mínútur á milli vagnlesta (25 m)**  
Hraðaminnkun í þéttbýli og yfir tvær brýr á leiðinni, 50 km

# PAJALA námuvegurinn

ROADEX / RoadScanners vann úttekt, áhættugreiningu og gerði tillögur um styrkingar vegna þessa verkefnis og hvað þyrfti til ef álagið yrði aukið frá 60 tonnum í 72, 90, 136, 146 og 153 tonn.





**ROADEX**  
Implementing Accessibility

[www.roadex.org](http://www.roadex.org)