

## Grant Submission Document

### Project Title:

Evaluating the cost of environmental impact due to geothermal utilization

### The number and name of the WP the proposal refers to

WP7

### Project Coordinator/ Managing Entity

**Organization:** University of Iceland – Faculty of Economics - Faculty of Life and Environment and Sciences

**Name of Coordinator:** Brynhildur Davíðsdóttir  
**Phone / email:** 525 5233 / [bdavids@hi.is](mailto:bdavids@hi.is)

**Name of Finance Manager:** Sigurður J. Hafsteinsson  
**Phone / email:** 525 4094 / [sjh@hi.is](mailto:sjh@hi.is)

### Other Participants

**Organization:** University of Iceland – Institute of Economic Studies

**Name of contact person:** Sveinn Agnarsson  
**Phone / email:** 525 4535/ [sveinnag@hi.is](mailto:sveinnag@hi.is)

**Organization:** University of Iceland – Faculty of Economics

**Name of contact person:** Daði Már Kristófersson  
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**Organization:** Reykjavik Energy

**Name of contact person:** Hólmfríður Sigurðardóttir  
**Phone / email:** holmfridur.sigurdardottir@or.is

**Organization:** Efla  
**Name of contact person:** Ólafur Árnason  
**Phone / email:** [olafur.arnason@efla.is](mailto:olafur.arnason@efla.is)

**Organization:** Portland State University  
**Name of contact person:** Robert Costanza  
**Phone / email:** Robert.Costanza@pdx.edu

### Project Key Words

Geothermal utilization, environmental impact, economic valuation of environmental impact.

### Project Abstract

This project aims to (1) set up the theoretical framework for assessing the environmental costs associated with the development and use of geothermal power (2) test the various methods that can be used to assess environmental costs and (3) perform a pilot economic evaluation study on the environmental impact of geothermal power at a selected Geothermal power plant in Iceland. Research and a pilot study on economic assessment will create domestic expertise on the issue, and will further Iceland's status as a leader in sustainable geothermal utilisation and assessment.

## Eligibility Rules

For application to be eligible the following points shall be kept in mind.

- *The proposal needs to be submitted no later than 23:00 GMT on November 20<sup>th</sup> 2011*
- *The Coordinator of the proposal needs to be GEORG participant.*
- *The Grant submission document shall neither exceed 10 pages (including front page, this page, figures, tables and references, but excluding cv's) nor shall it exceed the maximum number of words for each section of the document.*
- *The budget plan shall be prepared and demonstrated according to Section I- Chapter 6 of the "Proposal & Award Policies & Procedures Guide" for the 4<sup>th</sup> Call.*
- *The proposal shall address clearly problems and questions of importance for development of the geothermal sector. For information on GEORGs objectives please find GEORG - WP description at [www.georg.hi.is](http://www.georg.hi.is)*

### Eligibility check list:

	Yes	No
<i>Is the coordinator of the proposal a GEORG participant?</i>	x	
<i>Does the proposal follow all applied rules regarding format of the proposal?</i>	x	
<i>Does the proposal follow all applied rules regarding the budget</i>	x	
<i>Does the proposal address clearly problems and questions of importance for development of the geothermal sector?</i>	x	
<i>Is the proposal, incl. all required appendixes, submitted in due time?</i>	x	

**Proposal that do not fulfill the eligibility rules listed above will not be evaluated by the Review Committee.**

## Project description

### *General description*

The tradeoff between environmental services, such as the access to unspoiled nature, and industrial development has been the focus of heated debate in recent years. The most noticeable discussion in recent years has been the debate over the hydropower project at Kárahnjúkar and the subsequent aluminum plant in Reyðarfjörður. As knowledge accumulates on the significant economic value of the services derived from the environment, an inclusion of those values when assessing the economic implications of a development project has become a necessity – and therefore evaluation methods must be extended to take account of the **full cost** of proposed projects. Approving a project that has significant environmental impact implies that the value of the economic cost of the affected environment must be less than the financial gains from the project, without ever trying to access what the actual cost of the damage is. This may lead to decisions being made that significantly reduce social welfare. The OECD has numerous times advised Iceland to begin accounting for the environment in economic assessment of development projects, with a particular emphasis on the development of energy resources (see e.g. OECD, 2008 and 2009, Economic Survey: Iceland), but we have yet to do so.

The main purpose of this proposed project is to provide the framework for and pilot the first comprehensive economic valuation of the environmental impact of an energy development project in Iceland, with a focus on geothermal development. This will also be the first comprehensive study on the economic implications of the environmental impact of geothermal power, in the international academic literature.

Environmental services are defined as those functions of the environment that support (directly or indirectly) human welfare (Costanza et al. 1997<sup>1</sup>, Daily 1997<sup>2</sup>) and therefore are defined by the benefits people obtain from the biosphere and its ecosystems. The development of geothermal power can affect many such services. When assessing the economic value of the various environmental services, and hence e.g. the economic implications of environmental degradation as that implies a loss in services, the services provided by a particular area must be identified, classified, and then valued with state of the art-valuation methods. Various classification schemes have been devised such as by De Groot et al (2002<sup>3</sup>), and by researchers working on the Millennium Ecosystem Assessment. In this study we will rely on the MEA classification system.

**Full** economic valuation, contrary to financial valuation, includes every accountable item in a financial valuation plus any costs and benefits, which do not affect financial results but affect or

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<sup>1</sup> Costanza, R., d'Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R. V., Paruelo, J., Raskin, R. G., Sutton, P., & Belt, M. van den 1997. The Value of the World's Ecosystem Services and Natural Capital. *Nature*, 38, 253-260.

<sup>2</sup> Daily, G.C. 1997. *Nature's Services: Societal Dependence on Natural Ecosystems*. Washington D.C.: Island Press.

De Groot et al., 2002, A typology for the classification, description and valuation of ecosystem functions, goods and services, *Ecological Economics*, 41:393-408.

will affect positively or negatively social welfare. An example of such costs and benefits is e.g. the impact of development on the environment. No market prices exist for most of the environmental services influenced by the development of geothermal power. However, several methods exist and are well known for assessing the value of changes in environmental quality and provisioning of services, which readily can be linked to impact results from LCA analyses – providing LCC assessment, varying of course what they measure and the data required (see e.g. Freeman 2003<sup>4</sup> for an overview of valuation methodology). The methods are categorized into either based on revealed or stated preferences. Revealed preference techniques, look at decisions people make in reaction to changes in environmental quality and provisioning of services. These methods estimate the value of environmental services based on e.g. the demand for market goods, either used in the consumption of the environmental service or affected directly by the access of an environmental service. The most commonly used revealed preference techniques are: the travel cost method, hedonic pricing as well as methods based on costs of maintaining an environmental service, restoring it or avoiding damage. Stated preference techniques such as contingent valuation elicit values through survey methods. In this study, the appropriate state-of-the-art evaluation methods will be applied to each identified affected environmental service. Only one study in Iceland has been performed on the economic evaluation of environmental services, which is the evaluation of the ecosystem services of Heiðmörk.

This proposed study includes experts in economic evaluation of environmental services, including the internationally leading scholar in such assessments, experts in the environmental impact of geothermal resources, as well as experts in performing environmental impact assessment.

### ***Scientific – and/or Technical Merit***

The study has both academic and practical contributions. The main purpose of the project is to provide the first comprehensive economic valuation study of the environmental impact of a geothermal development project, using state-of-the-art valuation methods. This study will serve as a point of reference for future valuation studies and be useful to owners and managers of energy resources in Iceland. As the recently submitted energy policy for Iceland stipulates that such evaluation may become a requirement in the future, it is essential that we begin building knowledge and expertise in this area – which will be useful both to energy companies, engineering firms as well as public officials.

The study also has an important academic value. Most studies of the economic value of environmental services focus on a particular type of services. A holistic yet structured assessment of the impact of a development project on the provisioning of services will require a holistic assessment of multiple services simultaneously. Valuing such a full range of services provides a number of academic challenges that will be of interest in the general field of economic valuation. This especially involves issues related to double-counting of benefits (costs) and the opportunity cost of providing one service in terms of a loss in another. Furthermore, neither a comprehensive economic evaluation study of the environmental impact of geothermal development has been done before, nor have the LCA derived impact values been properly transformed to cost values, and thus this study is an extremely important addition to the

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<sup>4</sup> Freeman, 2003, The measurement of environmental and resource values, RFF press.

burgeoning literature on environmental services and costing of environmental impact.

### ***Innovation / Entrepreneurship***

Due to the novelty of applying the specific economic analyses methodologies to the field of geothermal energy, as well as developing and testing the methodologies in an Icelandic context, the Icelandic research arena within this field will be greatly enhanced both domestically as well as within the international research environment, and thus enable Icelandic experience and expertise to lead internationally in sustainable geothermal utilisation and assessment.

The researchers involved in this project will gain unique competence within an emerging and important field of economic evaluation, and they will gain the opportunity to be leading actors in further studies and practice of the related methods. The conclusions may highlight interesting and necessary development areas both in economic evaluation (which could be transferred to other energy types ) and for further development of techniques and technology for utilising geothermal energy. All of which, resulting in exciting entrepreneurial opportunities.

Finally, the project establishes new and strengthens existing research cooperation relations between Iceland and foreign partners.

### ***Education / Dissemination***

The roots of the project are mutually grounded within the Icelandic academic and research arena, consulting and the geothermal industry, and will facilitate the involvement of a PhD student, enhancing his interaction with both academic research institutes and related companies. The student will be mentored by geothermal specialists and highly qualified specialists in economic assessment of environmental impact, ensuring the quality of research and other academic training.

The derived conclusions ultimately aim towards developing technology and utilisation strategies of geothermal energy that minimize the economic cost of environmental impact. They will be presented to both decision makers and practitioners at all levels of decision-making. Energy companies and the consulting industry participate in or are already connected to the project, securing continual flow of information and results to these key actors within the geothermal energy arena.

Both the methodologies and the specific conclusions of the project will be published and disseminated through all the different pathways of the GEORG WP8 (public website, publications, conferences and events). Aiming for publications in journals such as the Energy Journal, Energy Policy, Geothermics and Ecological Economics.

## Managerial

The project steering committee consists of all the project participants listed in this document (CV's given below) and is lead by Dr. Davidsdottir. She has led the Heidmörk valuation project and thus has extensive experience in managing large interdisciplinary valuation projects, but the entire team involved is assumed to meet every 3 months. Project partners are from a range of different sectors and numerous disciplines, resulting in a strong network of actors in Iceland that possess a robust and broad knowledge, both within the geothermal arena and the fields of the economic analyses applied within the project. Our international partner is one of the most recognized international scholars in the valuation of environmental services and environmental impact.

The project group is in possession of all needed tools, facilities and expertise needed to see this project through using state-of-the-art evaluation methods.

Access to geothermal power stations and all relevant data is secured through the involvement of Reykjavik Energy, as the proposed pilot site is operated by RE. As an LCA study has already been performed at the chosen site, this access is invaluable for the project.

## Financing:

Cost item		Requested funding		Other financing		Total
2012/2013	Salaries					13,336
	Operational expenses					0
	Travel expenses					300
	<b>Total 2012/2013:</b>	6,150	45%	7,486	55%	13,636
2013/2014	Salaries					13,336
	Operational expenses					0
	Travel expenses					300
	<b>Total 2013/2014:</b>	6,150	45%	7,486	55%	13,636
2014/2015	Salaries					13,336
	Operational expenses					0
	Travel expenses					300
	<b>Total 2014/2015:</b>	6,150	45%	7,486	55%	13,636
<b>Grand Total</b>		<b>18,450</b>	<b>45%</b>	<b>22,458</b>	<b>55%</b>	<b>40,908</b>

## Explanation of cost:

Brynhildur Davíðsdóttir (UoI): Project management - complementary contribution.

Hólmfríður Sigurðardóttir (OR): Expertise input on environmental impact of geothermal use and access to relevant data - complementary contribution.

Ólafur Árnason (Efla): Expert on environmental impact assessment - complementary contribution.

Daði Már Kristófersson (HI): Expertise input on economic evaluation - complementary contribution.

Sveinn Agnarsson (HI): Expertise input on economic evaluation - complementary contribution.

Robert Costanza (PSU): Expertise input on economic evaluation - complementary contribution.

Ph.D. student (UoI): PhD Student salary applied for.

### ***Work plan and time schedule:***

<b>Task</b>	<b>Subtask</b>	<b>Timeline (year-month)</b>	<b>Milestone</b>
Initialization – introduction- hire of PhD student		1-1 to 1-3	Hire of student, project plan finalized
Literature review	Review of economic evaluation methods	1-1 to 1-12	Review article of economic evaluation methods in the context of energy projects
	Review of economic evaluation of energy projects	1-1 to 1-12	
	Links from LCA derived impact to economic evaluation		
Physical analysis of the affected environmental services in study area	Analysis of environmental impact assessment in pilot area	2-1 to 2-6	Framework for classifying and valuing environmental services affected by energy projects
	Analysis of the LCA impact in the pilot area		

			Framework for environmental impact – linked to environmental services
	Identification of the affected ecosystem services in the area	2-1 to 2-6	
	Assessment of the impact of project on ecosystem services	2-1 to 2-6	
Economic evaluation of affected environmental services	Provisioning services	2-6 to 3-6	Assessment framework for economic evaluation of environmental impact
	Supporting services	2-6 to 3-6	Results from pilot study
	Regulating services	2-6 to 3-6	
	Cultural services	2-6 to 3-6	
	Holistic assessment	3-4 to 3-6	
Completion of thesis and development of journal articles.	Thesis writing	3-1 to 3-12	PhD thesis
	Journal articles	3-6 to 3-12	3-4 journal articles



## Appendix I Applicant CV

**Brynhildur Davíðsdóttir**    **bdavids@hi.is**

### Education

2002	PhD degree	<b>Boston University</b> , Energy and Environmental analysis
1995	MA(dual)	<b>Boston University</b> , International relations/resource and environmental analysis
1991	BSc	<b>University of Iceland</b>

### Professional experience

2006 -		Associate Professor, University of Iceland.
2004 - 2006		Adjunct professor Boston University
2004 - 2006		Associate at Abt Associates Inc. ( <a href="http://www.abtassociates.com">http://www.abtassociates.com</a> ).
2002 -		Book review editor, Ecological Economics
2002 – 2004		Research assistant professor/lecturer Boston University
2002 – present		Book review Editor of Ecological Economics

### Administration

#### *Administration of selected research, government and development projects (2004–2011)*

2009 – 2011	Member, task force for creation of an Energy policy for Iceland
2007 –	Head, Expert Committee to reduce GHG emissions from Iceland
2009 – 2012	Principal-Investigator, Valuing Ecosystem Services, Funded by RANNIS and others
2007– 2010	Principal-Investigator, Indicators for Sustainable Energy Development, Funded by UOOR and others
2007 - 2009	Principal investigator, Ecological Footprint of using renewable energy, Funded by UOOR
2007 - 2010	Principal investigator, The dynamics and total cost analysis of technological transitions: focus on the transition to a low carbon economy in Iceland.

### Scientific publications

#### *Key publications (2005–2010)*

- Davidsdottir B., and M. Fisher, 2011, The Odd Couple: The relationship between carbon emissions economic intensity and economic prosperity, *Energy Policy*, 39(8): 4551-4562.
- Davidsdottir, B., og Agnarsson S., 2010, The cost effectiveness of mitigating greenhouse gas emissions in Iceland, Þjóðarspejillinn 2010. In *Rannsóknir í félagsvísindum X: hagfræði og viðskiptadeild*, Félagsvísindastofnun Háskóla Íslands.
- Davidsdottir B. 2010, The link between ecosystem services and human wellbeing, *Proceedings of Þjóðarspejillinn 2010*.
- Ruth, M. and B. Davidsdottir, 2009, *The Dynamics of Regions and Networks in Industrial Ecosystems*, Edward Elgar Publishing, UK.
- Ruth, M., B. Davidsdottir, 2008, *Changing Stocks, Flows and Behaviors in Industrial Ecosystems*, Edward Elgar Publishing, UK.
- Davidsdottir, B., 2007, The Price is Right?, in *Art Ethics and Environment*, Cambridge Scholars Press, Cambridge UK.
- Davidsdottir, B. D. Basoli, S. Fredericks, C Enterline, 2007, Measuring Sustainable Energy Development: the development of a three dimensional index – the SEE index, in *Frontiers in Environmental Valuation and Policy*, Edward Elgar Cheltenham, United Kingdom.
- Davidsdottir B., 2007, Sustainable Energy Development?: the case of Iceland, In *Proceedings of ACEEE summer study on energy efficiency*, Summer 2007.
- Davidsdottir, B., and M. Ruth, 2007, Industrial Inertia and Environmental Performance – Opportunities and Constraints for Environmental Policy, *International Journal of Energy and Technology Policy*.
- Davidsdottir B., and M. Ruth, 2005, “Pulp non-fiction: Dynamic Modeling of Industrial Systems,” *Journal of Industrial Ecology*, 3(9): 191-212.

Sveinn Agnarsson - sveinnag@hi.is

#### CURRENT POSITION

2010 Director of the Institute of Economic Studies, University of Iceland.

#### EDUCATION

1998 Ekon. dr. in economics, Gothenburg University, Sweden.

1989 Cand. oecon in economics, University of Iceland.

1982 BA in history, University of Iceland.

#### PRIOR ACADEMIC APPOINTMENTS

1998- Reader at the University of Iceland.

1997-2007 Researcher at Institute of Economic Studies.

#### FELLOWSHIPS AND GRANTS

2005-2006 Icelandic Centre for research. Setting the global optimal policies for sustainable fisheries: Comparative study of fisheries policy.

1999-2001 Icelandic Centre for Research. Postdoctoral scholarship.

1996-1997 Göteborgs Handelshögskolefonder.

1994-1996 Tore Browaldhs Stiftelse för Vetenskaplig Forskning och Undervisning.

#### Selected publications:

1. "Using qualitative and quantitative stakeholder knowledge: Examples from European deep-water fisheries" (with Pascal Lorange, Dimitrios Damalas, Sophie des Clers, Ivone Figueiredo, Juan Gil and Verena M. Trenke), in: *ICES Journal of Marine Science*, 68(8) (2011), 1815-1824.
2. "Property rights in Icelandic fisheries," (with Thorolfur Matthiasson) in *Handbook of Marine Fisheries Conservation and Management*, ed. R. Quentin Grafton, Ray Hilborn, Dale Squires, Maree Tait, and Meryl Williams, Oxford (Oxford University Press), 2010.
3. "The cost effectiveness of mitigating greenhouse gas emissions in Iceland," (with Brynhildur Davidsdottir), in: *Rannsóknir í félagsvísindum XI, hagfræðideild*, ed. Dadi Mar Kristofersson, Reykjavík (Félagsvísindastofnun), 2010.
4. "Economic impact of angling on Scotland and Iceland," (with Alan Radford and Geoff Riddington), in: *Global challenges in recreational fisheries.*, ed. In Øystein Aas, Oxford (Blackwell Publishing), 2008.
5. "The role of the fishing industry in the Icelandic economy," (with Ragnar Arnason), in: *Advances in fisheries economics. Festschrift in honour of Professor Gordon R. Munro*, ed. Trond Bjørndal, Rashid Sumaila, Daniel V. Gordon and Ragnar Arnason, Oxford (Blackwell Publishing), 2007.
6. "Iðnaður, sjóðir og banki (Industry, funds and a bank)," in: *Rætur Íslandsbanka. 100 ára fjármálasaga*. (Roots of Islandsbank. A 100 years monetary history), ed. Eggert Thor Bernhardsson, Reykjavík (Íslandsbanki), 2004. In Icelandic
7. "Fjármagnið og útgerðin (Capital and harvesting)," in: *Rætur Íslandsbanka. 100 ára fjármálasaga*. (Roots of Islandsbank. A 100 years monetary history), ed. Eggert Thor Bernhardsson, Reykjavík (Íslandsbanki), 2004.
8. "Family background and the estimated returns to schooling" (with Paul S. Carlin), in: *Journal of Human Resources*, 37(3) (2002), 680-692.
9. "The Norwegian Spring-Spawning Herring Fishery: A Stylized Game Model" (with Ragnar Arnason and Gylfi Magnusson), in: *Marine Resource Economics*, vol. 15 (2001), 283-319.

## Robert Costanza

Portland State University, Institute for Sustainable Solutions, Editor in Chief: Solutions.

### Professional Preparation.

University of Florida, Gainesville, FL	Architecture	B.A.	1973
University of Florida, Gainesville, FL	Architecture/Urban Planning	M.A.	1974
University of Florida, Gainesville, FL	Systems Ecology (minor Econ)	Ph.D.	1979
Louisiana State Univ., Baton Rouge, LA	Coastal Ecology	Postdoctoral	1980

### Appointments.

2010 – Present: University Professor of Sustainability, Director, Institute for Sustainable Solutions, Portland State University

2002-2010: Gund Professor of Ecological Economics and Director, Gund Institute for Ecological Economics, Rubenstein School of Environment and Natural Resources, University of Vermont

1991-2002: Professor, Univ. of Maryland Center for Environmental Science & Dept. of Biology

1991-2002: Founding Director, University of Maryland Institute for Ecological Economics

1988-1991: Associate Professor, Chesapeake Biological Laboratory, University of Maryland,

1984-1988: Associate Professor, Coastal Ecology Institute, Louisiana State University.

1981-1984: Assistant Professor, Coastal Ecology Institute, Louisiana State University.

**Publications** (n=420, 20 books, Total Institute for Scientific Information (ISI) citations > 3,500, ISI h-index = 31. Named as ISI Highly Cited Researcher (<http://isihighlycited.com/>), 2004-present)

#### 5 most relevant publications:

Costanza, R., L. Wainger, C. Folke, and K-G Mäler. 1993. Modeling complex ecological economic systems: toward an evolutionary, dynamic understanding of people and nature *BioScience* 43:545-555.

Costanza, R., R. d'Arge, R. de Groot, S. Farber, M. Grasso, B. Hannon, S. Naeem, K. Limburg, J. Paruelo, R.V. O'Neill, R. Raskin, P. Sutton, and M. van den Belt. 1997. The value of the world's ecosystem services and natural capital. *Nature* 387:253-260

Boumans, R., R. Costanza, J. Farley, M. A. Wilson, R. Portela, J. Rotmans, F. Villa, and M. Grasso. 2002. Modeling the Dynamics of the Integrated Earth System and the Value of Global Ecosystem Services Using the GUMBO Model. *Ecological Economics* 41: 529-560

Costanza, R., A. Voinov, R. Boumans, T. Maxwell, F. Villa, L. Wainger, and H. Voinov. 2002. Integrated ecological economic modeling of the Patuxent River watershed, Maryland. *Ecological Monographs* 72:203-231.

Costanza, R. and A. Voinov (eds). 2003. Landscape Simulation Modeling: A Spatially Explicit, Dynamic Approach. Springer, New York. 330 pp

#### 5 other publications:

Costanza, R., H. Daly, C. Folke, P. Hawken, C. S. Holling, A. J. McMichael, D. Pimentel, and D. Rapport. 2000. Managing our environmental portfolio. *BioScience* 50:149-155

Costanza, R. 2001. Visions, values, valuation and the need for an ecological economics. *BioScience* 51:459-468

Farber, S., R. Costanza, D. L. Childers, J. Erickson, K. Gross, M. Grove, C. S. Hopkinson, J. Kahn, S. Pincetl, A. Troy, P. Warren, and M. Wilson. 2006 Linking Ecology and Economics for Ecosystem Management: A Services-Based Approach with Illustrations from LTER Sites. *BioScience* 56:117-129.

Costanza, R., W. J. Mitsch, and J. W. Day, Jr. 2006. A new vision for New Orleans and the Mississippi delta: applying ecological economics and ecological engineering. *Frontiers in Ecology and the Environment* 4:465-472

Costanza, R., L. J. Graumlich, and W. Steffen (eds.). 2007. Sustainability or Collapse? An Integrated History and Future of People on Earth. Dahlem Workshop Report 96. MIT Press. Cambridge, MA.

## Hólmfríður Sigurðardóttir

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### UNIVERSITY EDUCATION

2005–2007 Reykjavik University - MBA in business.

1983–1987 Aarhus University in Denmark – M.Sc. in soil biology.

1980–1983 University of Iceland – B.Sc. in biology.

### CURRENT POSITION

2011– Reykjavik Energy – Head of Environmental Affairs.

### PREVIOUS EXPERIENCE

2008–2011 Reykjavik Energy – Head of Innovation and Development and Project Manager for CarbFix (www.carbfix.com).

2007–2008 Reykjavik Energy – Project Manager, Department Overseas Projects – R&D:  
– CarbFix “The Hellisheidi natural laboratory project – a joint research project on disposal of mineral carbon dioxide storage into basalts”.

– Environmental, planning and administration projects in relation to Orkuveita Reykjavíkur developments inland and abroad.

1998–2007 The National Planning Agency - Head of the Environmental Division.

1996–1998 The National Planning Agency - Specialist at the Environmental Division.

1996–1997 Technical University in Iceland – Lecturer in Environmental Impact Assessment.

1991–1996 Agricultural Research Institute – Division Manager.

1988–1991 The Horticultural College in Iceland – Head of the Environmental Division.

1987–1988 The Folum Research Station in Denmark – Specialist in environmental monitoring.

### RESPONSIBILITIES

2011 Director of the Board of REYST - Reykjavik Energy Graduate School of Sustainable Systems. From February – August.

2010– Board of Directors at Reykjavik Energy Invest.

2009 Mentor in a M.Sc. research project at REYST.

2008– Board of Directors at Prokatin ehf.

2008 Steering committee on leading scientific research, Nordic Council of Ministers.

2005–2007 Reykjavik University - Representative for MBA executive students in a quality advising group for the MBA education.

2002 Moderator for M.Sc. research project in soil biology at the University of Iceland.

1996–2002 The Icelandic Centre for Research, rating on application for grants.

1995 Steering committee on sustainable agriculture, Nordic Council of Ministers.

1990–1995 Mentor in a M.Sc. research project in soil biology at the University of Iceland.

1988–2004 The Association of Academics (BHM)-Head of the Environmental Committee and other responsibilities.

### LECTURES AND PAPERS

1987–2011 Several lectures and presentations at conferences, seminars and meetings on CO<sub>2</sub> storage, environmental impact assessment, land restoration and soil biology. Several of papers in scientific journals and newspapers on the same issues

## Curriculum Vitae

Name: Daði Már Kristófersson (Dadi Kristofersson)  
Address: Þingvað 45  
110 Reykjavík  
Iceland  
Telephone: + 354 567 1298  
E-mail address: dmk@hi.is  
Birthplace: Reykjavik, Iceland

## Education

Dr.Scient. in economics. Norwegian University of Life Sciences, 2005. Title of thesis “Markets and Heterogeneous Goods”  
Cand.Agric (M.Sc.) in resource economics. Agricultural University of Norway, 2000. Title of thesis “Can Contingent Valuation Estimates for Freshwater Fish Stocks be Transferred Across the Nordic Countries?”  
B.Sc. in agricultural sciences. Hvanneyri Agricultural Collage, Iceland, 1997. Title of B.Sc. thesis “Greining á framleiðni kúabúa” (e. Productivity analysis of Icelandic dairy farms)

## Recent publications in Refereed Journals

Asche, F., A. G. Guttormsen, D. Kristofersson and C. Roheim, 2010. US import demand for swordfish. *Food Economics*, 7, pp. 36 – 43.  
Kristofersson, D. & K. Rickertsen, 2009. High-grading in a Quota Regulated Fishery with Empirical Evidence from the Icelandic Cod Fishery. *American Journal of Agricultural Economics*. 91(2), pp. 335-346.  
Guttormsen, A. G., D. Kristofersson & E. Nævdal 2008. Optimal Fisheries Management Management of Renewable Resources with Darwinian Selection Induced by Harvesting. *Journal of Environmental Economics and Management*. 56(2): 167– 179  
Bjarnadóttir, E. & D. Kristofersson, 2008. The Cost of the Icelandic Transferable Dairy Quota System. *Icelandic Agricultural Sciences*. 21, pp. 29-37.  
Steine, G., D. Kristofersson, & A. G. Guttormsen, 2008. Economic evaluation of the breeding Goal for Norwegian Red Dairy Cattle. *Journal of Dairy Science*. 91 (1): 418-426.  
Kristofersson, D. & K. Rickertsen, 2007. Hedonic Price Models for Dynamic Markets. *The Oxford Bulletin of Economics and Statistics*. 69(3), pp 387-412.

## Recent books and book chapters

Nielsen, M., P. Andersen, L. Ravensbeck, F. Møller Laugesen, J. Levring Andersen, D. Kristofersson, S. Reithe, J. Nilssen, H. Ellefsen, 2010. *Samfundsøkonomisk afkast af pelagiske fiskerier i Nordøstatlanten*. Nordic Council of Ministers, TemaNord 2010:573, 123 p.  
Davíðsdóttir, B., Loftsdóttir, Á., Hallsdóttir, B., Skúladóttir, B., Kristófersson, D., Rúnarsson, G., Haraldsson, G., Reimarsson, P., Einarsson, S., Sigfússon, Þ.I., 2009, *Möguleikar til að draga úr nettóúttreymi gróðurhúsalofttegunda á Íslandi*, Skýrsla Sérfræðinganevndar, Umhverfisstofnuneytið.  
Kristofersson, D. & S. Navrud, 2007. Can Use and Non-Use Values be Transferred Across Countries? Chapter 11 in: Navrud, S and R. Ready (eds.), *Environmental Value Transfer: Issues and Methods*. Springer Verlag, Berlin, Germany, pp. 207-226.

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**Date of birth:** 26.06.1972  
**Company:** EFLA Consulting Engineers Ltd  
**Present position:** Environmental Assessment, Planning and Approvals, Division Manager  
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**Education:**

2001 – 2002 Oxford Brookes University: M.Sc. Environmental Impact Assessment and Management.  
 1993 – 1996 University of Iceland, B.Sc. Geography.

**Employment:**

2008+ Division Manager of EIA and Approvals at EFLA Consulting Engineers  
 2004+ Consulting Advisor and Project Manager at EFLA Consulting Engineers (former Línuhönnun)  
 Main fields: Environmental Impact Assessment, Strategic Environmental Assessment, Land Use Planning, Approvals, and Geographical Information Systems.  
 2002 – 2004 Environment Agency of Iceland:  
 EIA – statutory consulting and advisory body in environmental issues, land use plans, project supervision and mapping and management of GIS data and tools (ArcInfo, ArcIMS).  
 2002+ Lecturer at Hvanneyri Agricultural University: Supervision of a 3 unit module: Environmental Impact Assessment and Strategic Environmental Assessment within the Environmental Planning Department of the Agricultural University of Iceland.  
 2006+ Lecturer at the University of Iceland: Joint supervision of a 3 unit module: Strategic Environmental Assessment within the Engineering Department of the University of Iceland.

**Environmental Impact Assessment and Approvals. Recent Projects:**

Ongoing Silicon Metal Plant (66 000 tonnes) in Husavík, Norðurþing Municipality  
 Ongoing Brennimeislína 1 OHTL (400 kv)  
 2010 – 2011 Environmental and Social Impact Assessment for three geothermal developments in Indonesia (Ulubelu, Lahendong and Lumut Bali) to World Bank standards. Project carried out in partnership with Mott MacDonald.  
 2008 – 2011 Þorlákshafnarlinur 2 & 3, 220 kV OHTL, South Iceland. EIA and Land Use Plans  
 2009 – 2010 Norðurá - Landfill area, Refasveit, NA Iceland. EIA.  
 2008 – 2010 Sauðárkrókslína 2: High Voltage underground Cable (132 kV), North Iceland. Environmental Notice and SEA.  
 2008 – 2010 Hellullína 2: High Voltage underground Cable (132 kV), South Iceland. Environmental Notice and SEA  
 2008 – 2011 Bolaalda – gravel mine (6 million m<sup>3</sup>), Ölfus Municipality. EIA.  
 2008 – 2009 Becromal aluminum foil Plant, Akureyri, Iceland. Environmental Notice and SEA.  
 2007 – 2009 Matfugl, poultry farm expansion. EIA.  
 2007 – 2008 Akureyri Airport, Akureyri, North Iceland. Environmental Notice  
 2007+ Nesjavallalína 2: High Voltage Underground Cable (132 kV), South Iceland. Environmental Notice and SEA.  
 2007 – 2008 Kröflulína 2: Rebuilding of a 220 kV Overhead Transmission Line, North Iceland. Environmental Notice.

**Land Use Planning and SEA. Recent Projects:**

2009+ Grindavík Municipal Plan: Overall revision of Grindavík municipalitie's development plan. Project Management, SEA, energy and environmental issues  
 2006+ Power Grid Infrastructure - SEA for Land Use Plans in 8 Municipalities in South Iceland  
 2007 – 2008 Hveragerði Local Plan – SEA for new residential areas for 1000 inhabitants in Kambaland area, Hveragerði, South Iceland. Consultation regarding environmental issues and SEA.  
 2007 – 2008 Hveragerði Municipal Plan and Local Plan – SEA for new residential areas for 4000 inhabitants in Sólborg – area, Hveragerði, South Iceland. My work involved in the writing of an SEA for the plan, consultation and presentations.

**Research Projects**

2004 – 2005 Landscape and Visual Assessment: A screening of methodologies worldwide. A research for Landsvirkjun, Landsnet and the Roads Administration  
 2006 – 2009 The Development of Methodologies for Landscape and Visual Assessment in Iceland. A research for Landsvirkjun, Landsnet, Orkuveita Reykjavíkur, HS-Orka, the Roads Administration and the Energy fund

