Presented by: Nick Mercer, Graduate Candidate E.P.I
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Renewable Energy as a Tool for Community Sustainability

BARRIERS TO WIND ENERGY DEVELOPMENT IN NEWFOUNDLAND & LABRADOR

Social Sciences and Humanities Research Council of Canada

Conseil de recherches en sciences humaines du Canada

Canada

Acknowledgements

- Thank you to my supervisory committee
  - Co-Supervisors: Dr. Gabriela Sabau, Dr. Andreas Klinke
  - Committee Members: Prof. Stephen Decker, Dr. Catherine Keske

Overview of Presentation

► 1) Renewable Energy as a Tool for Community Sustainability

   ► Strengthening our Communities

   ► Economic Sustainability

► 2) Current Research: A Case Study of Wind Energy Applying the 'AKTESP' Framework for Analysis

   ► Energy Overview

   ► Research Question/Objectives

   ► Methodology/Methods

   ► Work Completed

   ► Work to Be Done

► 3) Discussion & Questions

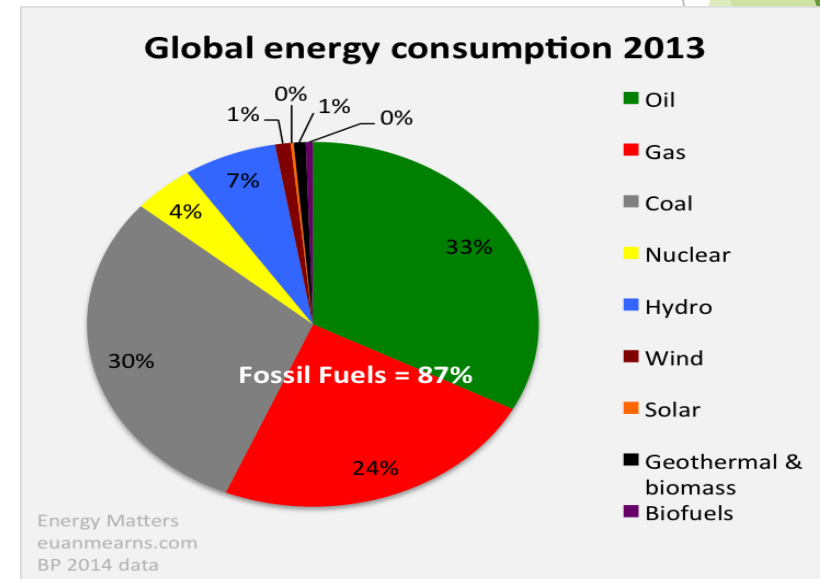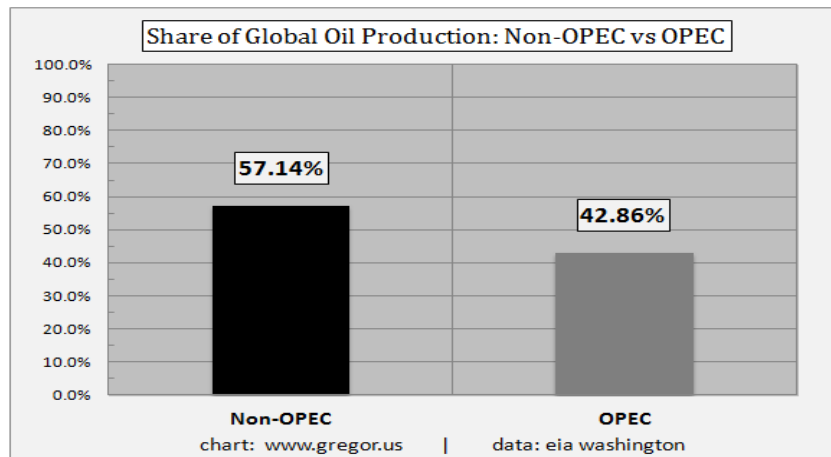# Renewable Energy as a Tool For Community Sustainability

▶ **Energy Security**
  ▶ Affordability and accessibility of energy
  ▶ Demand rising (1.4%/yr until 2030) IEA
  ▶ OPEC: 44% in 08', 52% in 2030
  ▶ RET reduces dependence

▶ **Environment**
  ▶ Runaway climate change at 2 degree increase. 450ppm
  ▶ Global peak 2015, 50% cut below 2005 levels
  ▶ 2050: 27% must be renewable

▶ **Public Health**
  ▶ IEA (05)' fossil fuels: $254bn globally, triple by 2030
  ▶ USA: $120 bn/yr, premature deaths

Share of Global Oil Production: Non-OPEC vs OPEC

Non-OPEC: 57.14%
OPEC: 42.86%

chart: www.gregor.us | data: eia washington

Global energy consumption 2013

- Oil — 33%
- Gas — 24%
- Coal — 30%
- Nuclear — 4%
- Hydro — 7%
- Wind — 1%
- Solar — 0%
- Geothermal & biomass — 1%
- Biofuels — 0%

Fossil Fuels = 87%

Energy Matters
euanmearns.com
BP 2014 data

Economic Sustainability

- ▶ Cost Competitiveness
  - ▶ Increasingly cost competitive
 - ▶ NL: Holyrood (16-19c/kwh). Wind (8c/kwh)

- ▶ Externalities
  - ▶ Missing inputs & outputs in costs
  - ▶ Fossil fuels $500-700bn subsidies in 09', $59bn RE
  - ▶ 10% global health/disease burden from air pollution, ½ directly from burning fossil fuels
  - ▶ Diminished ecosystems, water scarcity, loss of agricultural land/yield
  - ▶ Market price of coal - $0.09, w/ externalities $0.27, subsidies $0.27 (Epstein et al, 2011)

- ▶ Employment
  - ▶ 2010: 3.5mn jobs in RE
  - ▶ Fast growth: 235k in wind 05', 550k in 09'
  - ▶ RE creates 1.8-4x more jobs per MW installed (Satresa et al, 2011)
  - ▶ Safer jobs: longer employment, increased human capital

Projected LCOE in the U.S. by 2020 (as of 2015)
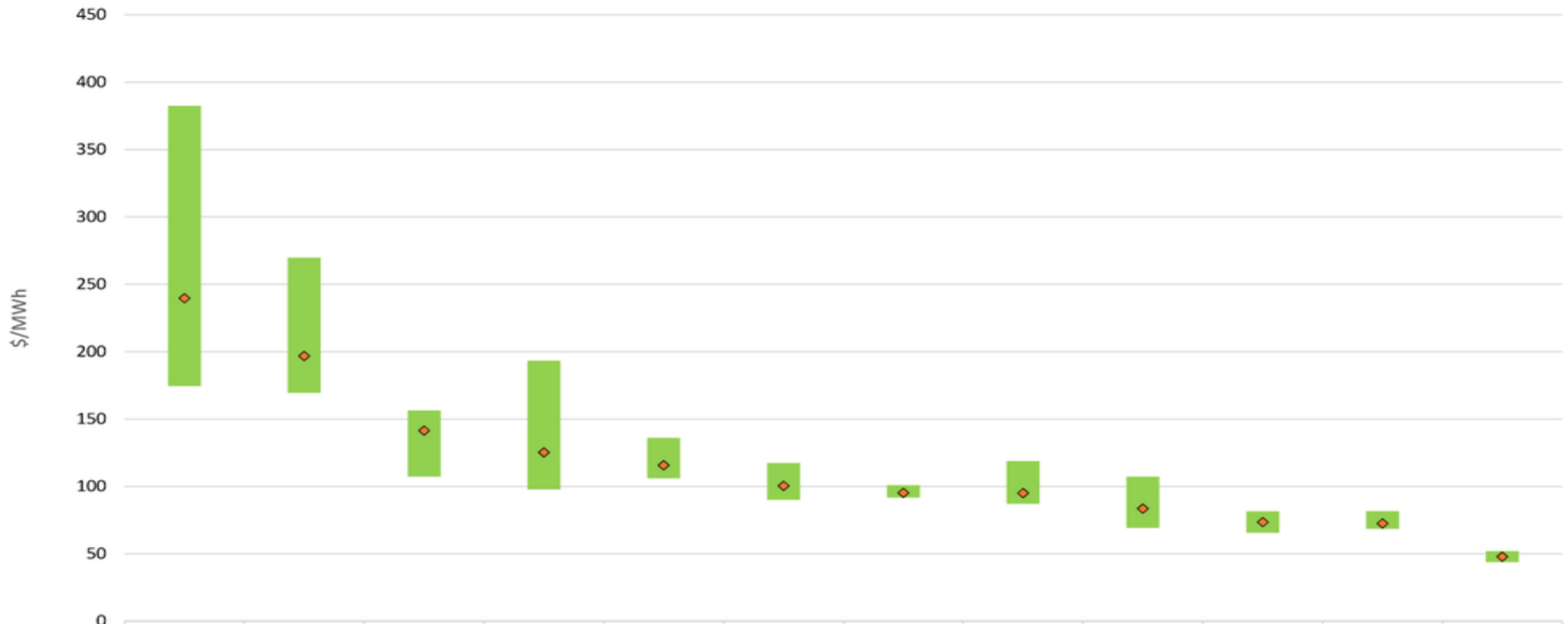
	Solar Thermal	Wind offshore	Natural Gas: Conventional Combustion Turbine	Solar PV	IGCC (Integrated Coal-Gasification Combined Cycle)	Biomass	Advanced Nuclear	Conventional Coal	Hydro	Wind onshore	Natural Gas: Advanced Combined Cycle	Geothermal
Minimum	174	170	107	98	106	90	92	87	69	66	69	44
Average	240	197	142	125	116	101	95	95	84	74	73	48
Maximum	383	270	156	193	136	117	101	119	107	82	82	52

Barriers to Renewable Energy Development in Newfoundland and Labrador: A Case Study of Wind Energy Applying the AKTESP Framework for Analysis
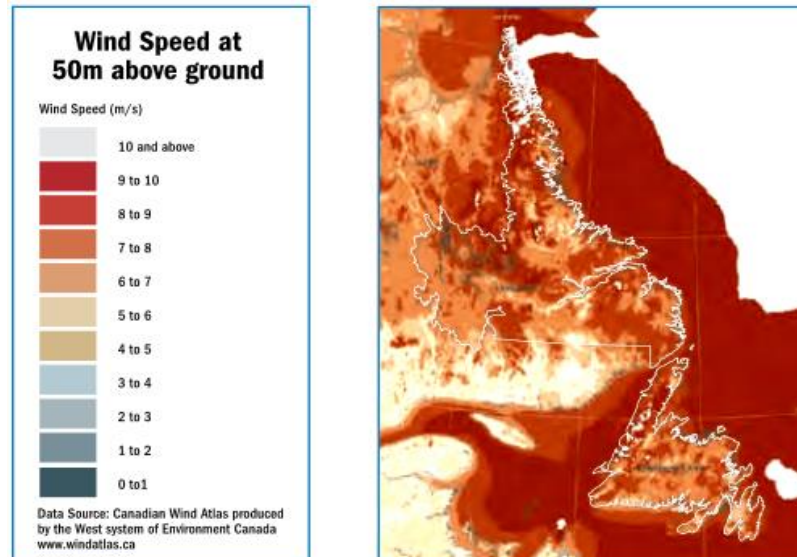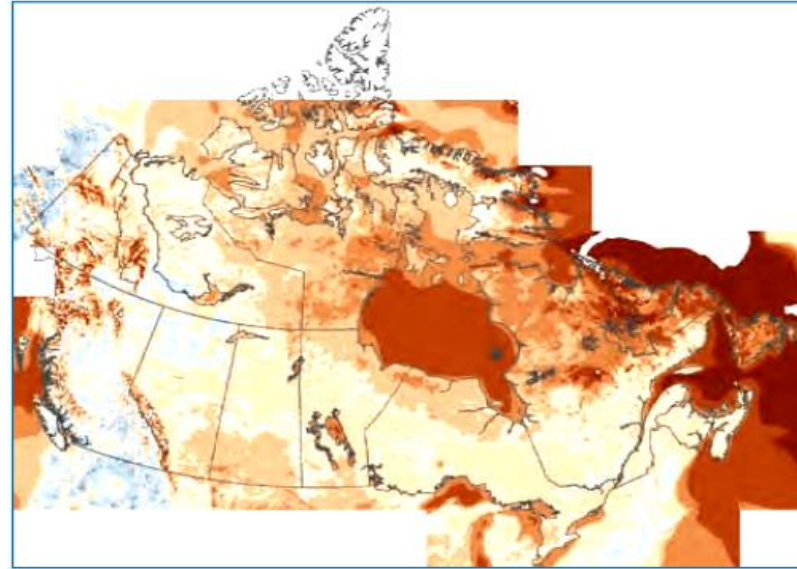

Supervisory Committee: Dr. Gabriela Sabau, Dr. Andreas Klinke,
Professor Stephen Decker, Dr. Catherine Keske

Introduction: Potential

- NL: 18,000MW Identified & Developed RES. Consume ~1900MW.

- Significant Potential: Canadian Wind Energy Atlas, Focusing Our Energy

- Wind Resource Map: 117x demand

- Labrador: 5,000MW harvestable

- Third last in Installed Capacity: 54 MW – above NWT, Yukon

Wind Energy Potential
Newfoundland and Labrador

Wind Speed at 50m above ground

Wind Speed (m/s)

- 10 and above
- 9 to 10
- 8 to 9
- 7 to 8
- 6 to 7
- 5 to 6
- 4 to 5
- 3 to 4
- 2 to 3
- 1 to 2
- 0 to 1

Data Source: Canadian Wind Atlas produced by the West system of Environment Canada
www.windatlas.ca

Fossil Fuels in Newfoundland and Labrador

- Energy Consumption
  - Holyrood Thermal Generating Station
    - 15-25%, rising to 35%
    - 1.1mn tonnes GHG, 11k tonnes SO2
  - 21 Isolated Communities
    - 15mn liters of diesel fuel/yr
  - Others:
    - Backup Gas Generators (127MW)
    - #Dark NL -> 120MW Turbine

- Fiscally Dependent
  - >27% provincial revenues from oil royalties (CAPP, 2014)
  - $1 drop -> $30mn dollar loss
  - Detrimental to social programs and spending

Research Question

- What are the barriers to renewable energy development in Newfoundland and Labrador?

Research Objectives

- To apply a case-study approach that will enable an understanding of barriers to RED in NL.

- To apply the AKTESP Framework to enable an understanding of wind energy development in NL.

- To develop a policy framework that will help address complex barriers to renewable energy development in NL.

Research Methodology

▶ Grounded Theory

  ▶ Facilitates exploratory research

  ▶ Differs from traditional research: choose theoretical framework, collect data to prove it applies/doesn't apply to phenomenon understudy

  ▶ Development of theory through analysis of data

  ▶ Repeated ideas -> codes -> categories. Categories may form basis for new theory
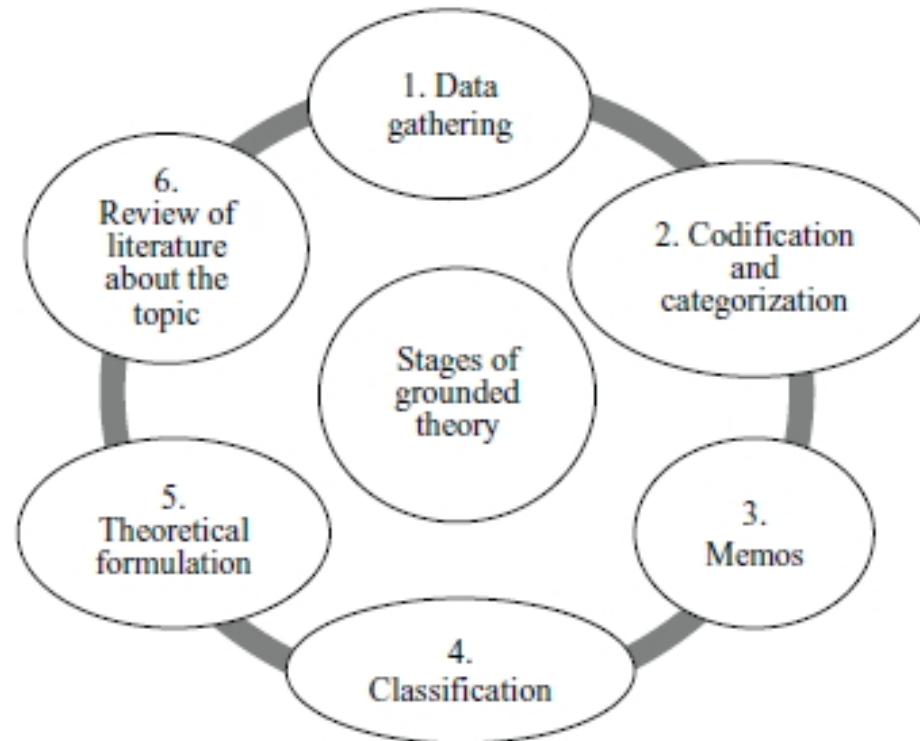
Research Methods: Data Collection

- Expert Interviews
  - Semi Structured/Open-Ended
  - Academia, community groups, private sector, government
- 'AKTESP' Framework for Analysis
  - Does barrier impede progress to solution?
  - Framework is continuous
- Sampling Methods
  - *Expert sampling
  - Snowball sampling

PROBLEM

AGREEMENT

KNOWLEDGE

TECHNOLOGY

ECONOMIC

SOCIAL

POLITICAL

SOLUTION
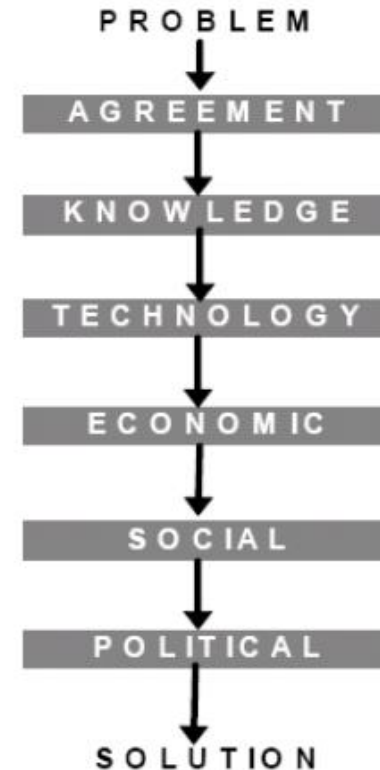
Figure 1: The AKTESP groups of barriers in Trudgill's Framework for Analysis .Source: Lim et al., 2009.

Research Methods: Data Analysis

- Interviews audio-recorded, manually transcribed
- Content Analysis
  - Qualitative research technique
  - Review text and 'code' into categories
- NVIVO: Advanced Qualitative Research Software
  - Creation of transcripts, 'nodes', categories, text queries
  - Identification of categories across participants

Work Completed

- Early work: Proposal, Lit. Review, Ethics Approval (GCREB), Participant Recruitment/Selection

- 15x Interviews to date

Preliminary Results (n=14)

▶ How Would You Describe the Current State of Wind Energy Development in Newfoundland and Labrador?

▶ Early Barriers Identified By Participants

  ▶ Agreement

  ▶ Knowledge

  ▶ Technological

  ▶ Economic

  ▶ Social

  ▶ Political

Work Remaining

- Five interviews remaining
- Continued data analysis
- Completion of thesis report

	Task description	Thesis Monthly Schedule													
		March (2015)	April (2015)	May (2015)	June (2015)	July (2015)	August (2015)	September (2015)	October (2015)	November (2015)	December (2015)	January (2016)	February (2016)	March (2016)	April (2016)
Phase 1)	Finish thesis proposal	x	x												
	Design Interview Questions		x	x											
	Apply for Ethics Approval			x	x										
	Secure Research Participants				x	x	x								
Phase 2)	Conduct Literature Review			x	x	x	x								
	Conduct Pretest							x							
	Collection of Data							x	x	x	x				
	Analysis of Data											x	x	x	x
Phase 3)	Chapter 1 (Purpose & Significance of Study)											x	x		
	Chapter 2 (Literature Review)			x	x	x	x								
	Chapter 3 (Methodolgy)												x	x	
	Chapter 4 (Findings)													x	x
	Chapter 5 (Discussion)													x	x
Phase 4)	Prepare for conferences and publications														x

Selective Bibliography

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Thank You

- Discussion & Questions?