Instructor - Eduardo Fernandez

APS1009 Natural Resources Projects, Management & Innovation -2024

INSTRUCTOR: Prof. Eduardo Fernandez

Overview:

Natural Resources (NR) and NR Sustainable Projects & Innovation, provide mankind with important ecosystem services such as Clean Water, Sustainable Clean Environment, Energy, Energy Renewables and Transition to Renewables, Minerals and Biological Resources from terrestrial and marine ecosystems, which are essential for the survival and development of mankind, and for new sustainable urban developments, special mention to new and smart cities, and rural development. However, the increasing demands for these NR, due to the Growth of the Human Population, Global Climate Change, Lost of Biodiversity, International Geo-Political Conflicts and Country Strategy, high demand of critical minerals for the manufacture of IT devises with the support of Ai and new technologies for all different fields and applications, including IoT, ecommerce, Manufacturing, New industrial innovations and processes, Health Care new devises, Transportation advancement, e-Mobility and Automation, also for power generation, transmission and distribution, electrification and rapidly global urban development (e.g. India and China), combined with the decrease in availability of these finite resources; All these new realities, bring about an urgent call for innovation and for a more new sustainable management on projects related to Natural Resources (2024) and the application of new R & D and innovation with the best management practices for a much more efficient usages of NR, and the implication on NR Projects and Management, 2024, for fixing the ill linear economy we are all living transforming It into a real Sustainable New Circular Economy: Reuse, Recycle, Repair, Redesign for Sustainability and Conservation of Natural Resources using the assistance of innovation, Ai, new technologies and Limited or Non-Recourse Financing; Project Finance.

Course Description:

This course aims to help students develop the necessary management capabilities required from engineers working nowadays on Sustainable NR, innovation, projects and NR Public and Private Enterprises and/or on Joint Ventures related to NR Projects, offering a unique view of the interdisciplinary challenges that are present today in Fall 2024, on this field and provides the knowledge to identify and develop Sustainable Solutions. Learning the necessary management tools, like analysis of the role of the different Stakeholders for NR projects, B/C analysis, Project Finance-Non Recourse Financing, P3 Public Private Partnership, economical and international geo-political and political conditions and environment, Project's Social considerations including The Social Benefit of the Project and also The Triple Bottom Line :People-Planet-Economics, Sustainable Project Risk Analysis and life cycle considerations of projects (Projects on Water, Environment, Energy, New Energy sources, Mining, Fishing, Rivers, Lakes, Forest ,Global and Local Climate Change and NetZero Projects are areas of Sustainable NR Projects in this course). The importance of the NR project's Long-Term shared Values and Positive Impacts related to Environmental, Social, Economics and Governance factors, are all fundamental in this course. The Net-Zero Transition plan is analyzed and What it could bring will be explained.

We will analyze real cases, based on the Management of NR Projects, on public sector, private sector, P3-Public Private Partnership, and public enterprises that oversee planning and developing NR not only in Canada but also internationally in developed countries and in emerging economies. We will have relevant experienced guest speakers from Canada and from abroad.

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Students will be evaluated as follows:

- 25 % participation in class, case studies and assignments
- 40 % group or individual project
- 35 % final test ----------During the course there will be tutorials via internet by appointments.

Course Content:

1) Introduction
1.1) Natural Resources (NR)Projects, Innovation and Management, -2024
The Water Crisis. Energy Transition and Innovation. The usage of Ai in NR projects.
Sustainability and the New Circular Economy-Reuse-Recycle-Re-Design
1.2) Natural Resources: People-Planet, and the Economy. The case of India and China.
1.3) The need for Natural Resources Management and related Enterprises
1.4) Natural Resources Planning Issues, Fiscal Deficits and Natural Resources
1.5) Improving Public Enterprise for a more sustainable Management of NR
1.6) Performance measurement within the Public Enterprise, PPP, or JV.
1.7) Natural Resources and NR Projects in Canada. The Net-Zero Transition.
1.8) The Present: Sustainable Development and the extractive Industries
1.9) Life Cycle Assessment; Key elements, Example of Preliminary Flowchart for LCA
1.10) Natural Resource Economics and Externalities. Introduction on Ai and the environment-2024

2) Management Objective-Managing Tools on Natural Resources Projects-2024
2.1) Benefits / Costs Analysis in Natural Resources Management
2.2) Policy, Planning, Organization and Administration as a Management System
2.3) Public Enterprise, Private Enterprise, PPP, and Advocacy System
2.4) Planning Process and Stakeholders
2.5) Examples of Agency Planning
2.6) Water Management Project: Public Enterprise and Management, Case Analysis

3) 3.1) Introduction to Environmental Assessment, Managing Project's impact

3.2) Introduction to Environmental Remediation

4) Projects on Energy Transition, a Global perspective -2024

5) Natural Resources Enterprises Business and Coordination

6) Natural Resource Projects and Enterprises; Project's Value Proposition

7) Management Tools in NR projects:
7.1) PESTLE & SWOT Analysis, VRIO Analysis, Porter's 5 Forces Analysis & 4Ps
7.2) Financial & HHRR (TEAM) Management and Organization:
7.2.1 Capex & OPEX.
7.2.2 Project Finance: Issuing bonds and Cash Flow forecast. Cash Flow Risk
7.2.3) Project Management in NR under 3Ppartnership and within the Public Enterprise
7.2.4) Process Management, KPI and KGI -BPM
7.2.5) Team oriented organization in NR Projects,3P, Private and Public Enterprises in NR

8) National Funds managing Natural Resources proceeds, Investing Internationally
8.1) Some Examples: The Government National Pension Fund of Norway. CORFO-CHILE
8.2) Other State-Owned Funds and development agencies on NR Management.

9) International Contracts & Investment in NR Projects and Management. CSR-examples
9.1) Type of Contracts
9.2) Concerns dealing with Expropriation
9.3) Partnership with National Development Agency, example EDC and CCC/Canada
9.4) Case Studies and Lessons Learned
9.5) Nuclear Energy Project in Canada
9.6) Water Project Management
9.7) A Canadian Company developing an Energy Project in Colombia, lessons learned
9.8) Risk and Cash Flow Management in Natural Resource Projects

10) Energy Projects, Management. Renewables & transition to Renewables
10.1) Managing the Need for NR as Energy Sources & Critical Minerals Supply
10.2) Energy strategy with current effects of international geo-political challenges.
10.3) Trade conflict EU-China-USA-Canada and International Energy & NR Geopolitics
10.4) Other main players on Natural Resources-2024: Australia, Canada, BRICS
10.5) Example of new projects in Renewables Energy: The case of California July 2024:
Giant Batteries that store solar power.
Successful case of CAISO- California Independent System Operator-2024
10.6) Wind, Water and Solar Energy are cheap, effective and green, we have 95% of the technologies needed to solve climate crisis. Big Batteries are part of the solution.

11) Carbon reduction new technologies, financing and projects-2024:

12) The present Fall 2024:
12.1) Discussion on AI, ML, Big Data and Blockchain applications to NR Projects:
Innovation on Natural Resource Management & Projects,
Climate change and new areas of NR and Projects -2024.

13) The Future:
Natural Resources innovation, Projects and Management,2025, an Optimistic Approach; New technologies on Conservation of Natural Resources and Ai.

Academic references for this course:
Suggested texts for learning:
Course Pack for APS1009 U of T, Prof. Eduardo Fernandez
Introduction to Environmental Assessment;4th edition,2021- Bram F. Noble
No Textbook is required.

Suggested texts for additional relevant learning:
- Sustainable Energy. Cengage Learning. By Dunlap, Richard. 2019.
- Natural Resource Management and The Circular Economy. By Brears, Robert.

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Day to Day Calendar-DRAFT-Start Date: Thursday, Sep. 5th; to Thursday, Dec. 5th

Week #	Date	Topics	Reading & Assignment
1	09/05/24	Sustainable Projects on Natural Resources (NR) Management, Enterprise & Innovation The Circular Economy. Sustainability and usage of Ai for productivity in NR Projects. Emerging Economies: Usages of NR Planning, Policy, Mngt. and Administration. Fiscal deficits. Commodities trade & Price: LME Analysis Tools: SWOT-PESTLE Analysis in NR Projects. Introduction to LCA/Flowchart for LCA	Sustainability/Climate Change/effects on Natural Resources projects (TBA) Net-Zero Transition. Circular economy/ Adaptation of Climate C. Ai applications-2025
2	09/12/24	Business responds to Sustainability & Investment. Issues on Public Natural Resources Enterprises. Business Overview on Natural Resources, PPP, Benefit-Cost Analysis- Global Energy Transition, International NR Project Finance/ Non-Recourse Financing. Economic analysis of Externalities Stakeholder Map/Stakeholder Management Process	PESTLE- analysis Water Issues Water Crisis in India TBA
3	09/19/24	Financial Management, CAPEX & OPEX, Cash Flow Forecast, Cash Flow & Country Risk Process Management, BPM & BPT, NR Management/Canada. The Net-Zero Transition	The Resource Gap/Canada Mining and Energy
4	09/26/24	National Funds managing Natural Resources proceeds. Development Agencies. International Contracts and Investment/ Natural Resources. PPP- Public Private Partnership	Business case/TBA Natural Res. Contract Renegotiations
5	10/03/24	International Natural Resources Management Case Studies, Lessons Learned Water Project Management and financing from Regional Development Banks Rethinking Institutions for NR Management, Financial Statement, and Cash Flow Risk	Water Crisis – Canada Article and Case.
6	10/10/24	Introduction to Environmental Assessment and Environmental Remediation Sustainable Energy and Natural Resources Projects Carbon reduction new projects, guest speaker	TBA
7	10/17/24	International Projects in Natural resources with PPP Nuclear Energy Project in Canada- PPP Guest speaker: World Bank Financing -Manager	TBA
8	10/24/24	Improving Public Enterprise Performance in Management of Natural Resources. KPI and KGI Guest speaker on IPO experience-Project Finance	International Joint venture in renewables project-Canada-France/ TBA
9	11/07/24	Environmental Impact and Health concern in NR Development-Conflict Minerals-Climate Change	Sino Iron in Australia

10	11/14/24	A Canadian Company developing Energy Project in Colombia- International Guest Speaker -CSR Risk Management in Natural Resource Projects	The Galore Creek Project.
11	11/21/24	The Future,2025, NR Projects & innovation: Digitalization. Optimistic Approach, Ai in 2025 and New Technologies for NR projects.Net-Zero 2050. Roles of Board of Directors on new NR projects Group Team Final Project Presentations	Final Team project presentation & report Project Paper Due - TBA
12	11/28/24	Group Final Project Presentations – Final Exam on Dec 5th 2024	FINAL EXAM TBA

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Some of The Management Tools/Concepts, to be learned in this 2024 course of Natural Resources Projects, Management and Innovation for your learning process and for the term final project:

Sustainable Project and Strategy/New Technologies

New Circular Economy considerations.Net-Zero2050

Life Cycle consideration on the Project

Key elements of LCA

Stakeholder mapping, Management and initial analysis. CSR-Corporate Social Responsibility in NR

Natural Resource (NR) Economics and Externalities

Benefit-Cost Analysis for Natural Resource Projects.

International Water Projects and Global Energy Transition- 2024

Project Finance in Natural Resource Development and Projects. Non-Recourse Financing

The Concept of Project Finance as non-recourse financing and P3. The participants and their roles.

Project Finance Documents and terms -DBFOT-BOT-BOOT

PPP- Public Private Partnership in Natural Resource Projects and Innovation

Introduction to Environmental Impact Assessment and Environmental Remediation

Canadian System of Environmental Economic Accounts; Natural Resource Asset Accounts (NRAA)

Multilateral International Development Banks Financing Environmental and NR Projects

Mitigation of Climate Change -Projects-Summary for Policy Makers

Financial Statement and Performance Measurement -Project Evaluation SWOT

Analysis- PESTLE analysis, Porter's Analysis on NR Projects.

Business Process Analysis and Business Process Management for Natural Resource Projects.

Canvas Business Model for Natural Resource Projects.

Financial analysis: CAPEX-OPEX -Cash Flow Forecast

Factors on Project Risk Analysis for Natural Resource Projects.

Managing Stakeholders and Coordination within the Enterprise and/or within the NR Project.

Board of Director's role and best practices. Environmental, Social, Economic and Governance.

Lessons to be learned from The Instructor's experience, and from international guest speakers.

Some feedback/ comments from the students of APS1009-Fall 2023, last year course evaluation:

“I will be recommending this course to everyone I know. The exposure to different applications of course content and the way in which it was taught was outstanding. It’s so diverse and the guest lectures were so valuable and informative. It’s courses like this which build U of T’s reputation of quality education and curated experiences for your degree”.

“The content which you’re exposed to is valuable and recent and Prof. Fernandez knows what he’s talking about. He’s passionate and a great professor”.

“This is the second time I have taken a course taught by Professor Fernandez. He is a true expert in the field, with a deep understanding of natural resource management and sustainable practices. His passion for the subject is evident in his teaching style, which is both engaging and informative. Prof. Fernandez also has shown a genuine interest in the professional development of their students, providing mentorship and guidance both inside and outside the classroom. He has spent time every week during office hours guiding each team towards their project. Overall, Prof. Fernandez's knowledge, passion, and dedication make him an outstanding educator and mentor. I believe this was one of the best courses designed and taught at the U of T’s Engineering”.

“Good professor, very willing to help student understand the concepts; Very insightful information was provided and needed”

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