



Urban water provision; Engineering considerations and Ethical [Framings]



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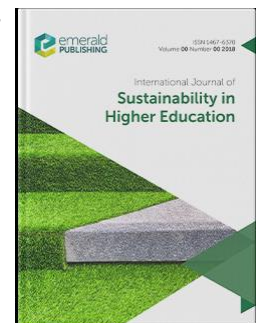
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Byrne, E.P. (2010) [Teaching engineering ethics and sustainability](#),
5th Engineering Education in Sustainable Development conference (EESD2010),
Gothenburg, Sweden, September 19-22.

Byrne, E. P. (2012) [Teaching engineering ethics with sustainability as context](#).
International Journal of Sustainability in Higher Education, 13(3): 232-248.



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THE IRISH TIMES

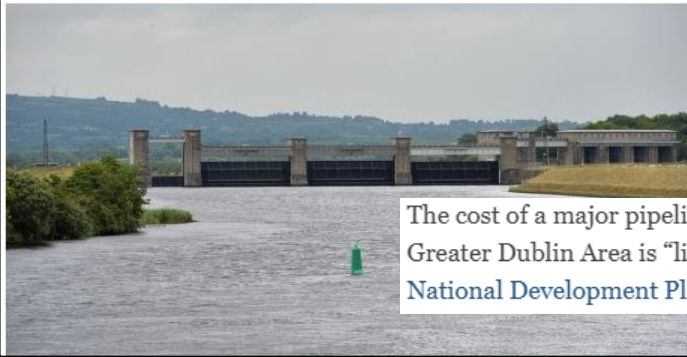
Shannon pipeline cost 'likely to exceed' €1.3bn

The 170km pipeline will carry water from the lower river Shannon to south Dublin

Wed, Jul 22, 2020, 02:39

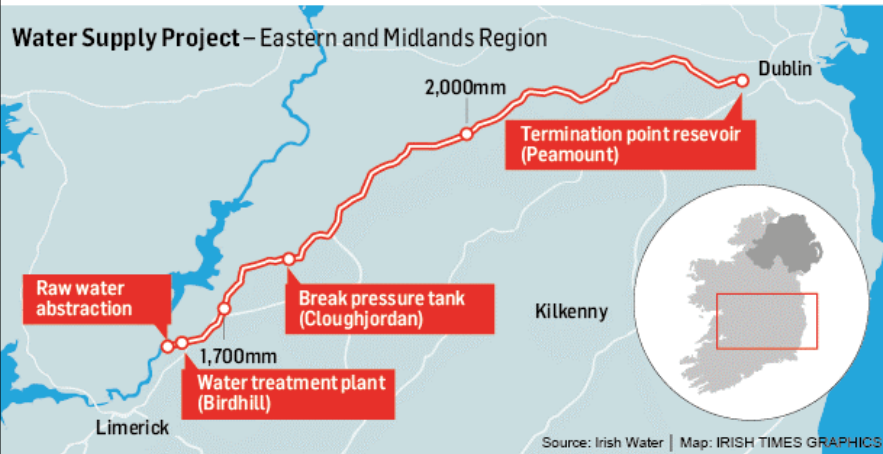
Shauna Bowers

LISTEN NOW 3:08



The cost of a major pipeline project aimed at increasing water supply to the Greater Dublin Area is "likely to exceed" the estimated €1.3 billion cited in the National Development Plan (NDP), Irish Water has said.

THE IRISH TIMES



170km pipeline from River Shannon to Dublin

THE IRISH TIMES

Shauna Bowers,
22 July 2020

River Liffey

About 85 per cent of Dublin's water supply comes from the river Liffey which is the "maximum sustainable abstraction" and "at risk from climate change", Irish Water said. The utility added that fixing leaks alone is "not enough to meet future demand and resilience".

The project has been in development since the mid-1990s, originally under Dublin City Council, and under Irish Water Management since 2014. It is the first comprehensive upgrade of Ireland's water infrastructure in more than 60 years.

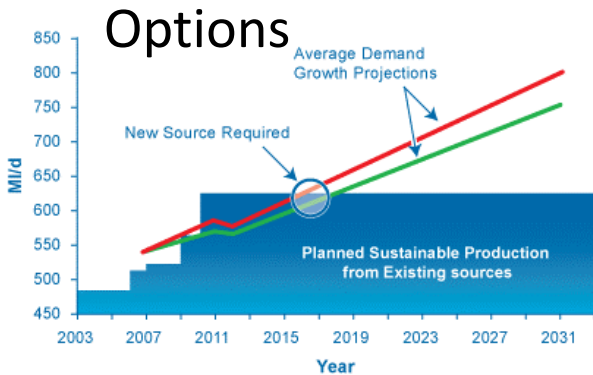
The timeline for the project states that construction will be carried out over a four-year period, commencing in 2023/2024, subject to "successful and timely outcomes to the associated planning and abstraction applications".

The project has faced public opposition from two campaign groups – Fight the Pipe and the River Shannon Protection Alliance – who say that the project will result in the "destruction of 2,000 acres" of farmland, and branded it as "simply wrong".



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2010: Engineering Consultant's Options



	Scenario	
	Medium to high	Low to medium
Population		
Leakage at 2031	20%	16%

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Student Ethics Group Assignment:

'A wicked problem; Water for Dublin'



Student Outputs

'One group appeared first in their presentation to rule out water abstraction from the Shannon on the basis that

*"taking water from the River Shannon on such a large scale is only a **temporary solution** to the problem, as we are all aware of the global decrease in freshwater levels", and that "many locations situated on or near the banks of the river Shannon depend heavily on the river for water. ..It is both unfair and **unethical** to take this water."*

They also went on to suggest that

*"In doing this project we asked ourselves **what is the role of an engineer?** Is it to carry out the task we are required to do or is it more than this?*

*To be innovative and futuristic or to offer solutions already known? We believe it is a **broader role.**"*





Student Outputs

'...Their proposed actions?

They advocated **desalination of Irish sea water** with **abstraction from the Shannon** as a back up, making no mention of **demand** issues.

Other groups merely chose one of the options, including one group which came up with an **elaborate scoring system** which allocated points to each option based on aggregate marks for a number of relevant criteria, thus making the implicit assumption that the whole equals the sum of the parts.

Each of the groups did relate the material to the professional codes of ethics, demonstrating how their proposals complied with the codes of ethics, though given the narrow interpretation of the task, their attempts could hardly be described as *"doing more than just complying with the codes"* [Engineering Council, 2009]

Engineering Council Guidance on Sustainability for the Engineering Profession (2009) London. <https://www.engc.org.uk/sustainability>

Byrne, E. P. (2012) Teaching engineering ethics with sustainability as context. *International Journal of Sustainability in Higher Education*, 13(3): 232-248



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Student Considerations

Determination of the Best Option

Option	Capability of Source	Infrastructure	Environmental	Economic	Socio-Economic	Total
A	1	10	3	9	3	26
B	5	8	4	8	10	35
C	7	4	7	5	10	33
D	1	4	2	9	4	20
E	6	8	8	8	8	38
F	9	8	8	6	10	41
G	8	4	5	6	4	27
H	9	4	8	1	7	29



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Consultant's Evaluation Report



Option Evaluation Summary (Draft)



WATER SUPPLY PROJECT
DUBLIN REGION

Options	Description	Technical		Environmental		Economic	Socio Economic	
		Source	Infrastructure	SEA	Habitats Dir (HDA)	Capex / Opex / Cost of Water Delivered	Navigation / Tourism / Agriculture/Angling / Local Economy / Flooding etc.	
Option A	Lough Ree	-	++	--	--	++	-	
Option B	Lough Derg	+	+	~	~	+	+	
Option C	Parteen Basin	++	~	+	~	-	+	
Option D	Lough Ree (Phase 1) / Lough Derg (Phase 2)	-	~	-	--	+	-	
Option E	Lough Ree + Storage (Bog)	~	++	+	-	~	~	
Option F	Lough Derg + Storage (Bog)	++	+	++	~	~	++	
Option G	Lough Ree (Lough Derg) + Impoundment	~	--	-	-	--	--	
Option H	Desalination	-	-	-	~	--	-	
Option I	Groundwater	Option cannot provide required quantities of water						
Option J	Liffey - Barrow Conjunctive Use	Option cannot provide required quantities of water						



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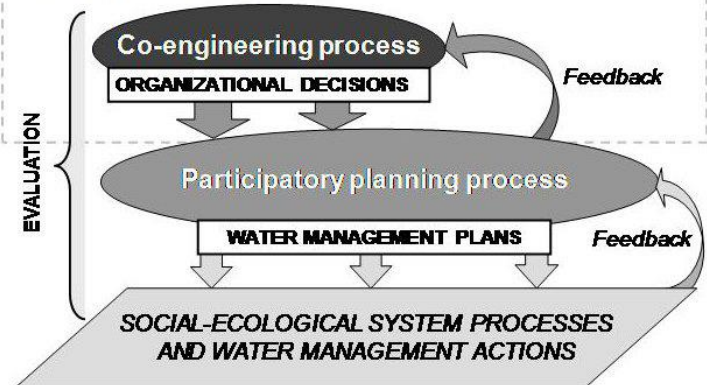
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Contemporaneous Literature

RESEARCH FOCUS AREA



Daniell, K. A. et al., (2010). **Co-engineering participatory water management processes: theory and insights from Australian and Bulgarian interventions.** *Ecology and Society*, 15(4):11. <http://www.ecologyandsociety.org/vol15/iss4/art11/>



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Reflection

'First year students ..generally find the concepts of **complex** and **wicked problems**, **inherent uncertainty** and **transdisciplinarity** far more challenging than that of **objective reality** and the prospect of **technical solutions through unique problem optimization**.

This is perhaps wholly **understandable** given their **backgrounds** and **context**, particularly as they were primed with an engineering report which proposes a technically based **'engineering solution' to a complex problem.**

Byrne, E. P. (2012) Teaching engineering ethics with sustainability as context. *International Journal of Sustainability in Higher Education*, 13(3): 232-248



Reflection: Broader Contexts?

'Perhaps a more balanced approach whereby students are directed to material which looks at the water supply and demand issues in places where consideration of these issues have **evolved (by necessity) to a greater extent**, such as for example, in **southwestern USA**, would lead to **greater student reflection, exploration and innovation**.

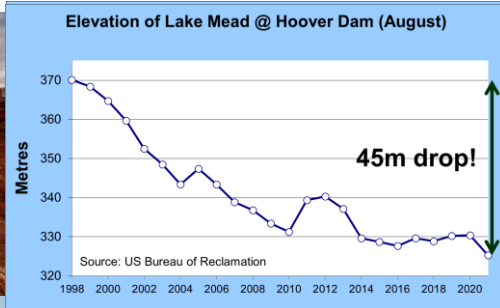
For example, Gleick (2010) proposes that while *"the waters of the west have been remade to serve humanity"*, and while *"these efforts brought important economic and social benefits"*, the upshot of this is that *"the systems we have built are **unsustainable** without fundamental change"*. In essence *"the **engineering of water reservoir and transference systems** as a comprehensive **solution** to Southwest water sustainability **has run its course**"* (MacDonald, 2010).'

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Industrial Revolution ...and Beyond



“e it” Genesis: 9, 7



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Sustainability Narratives/[Framings]

‘**Sustainability** has been invoked by a number of parties; the RPS Veolia report suggests that the “**sustainable availability** of 350Mld” is required from a new source and that “following consideration of feedback from the public consultation process, the water supply options were ranked in accordance with **long-term sustainability criteria** (Environmental, Economic and Social)” (RPS Engineering, 2010).’

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Sustainability Narratives/[Framings]

'On the other hand, opponents to the proposed Shannon scheme have also used **sustainability** as a basis for their objections. For example, the Shannon Protection Agency report (SPA, 2010) states the following (quoting the World Economic Forum Water Initiative (2009)):

*"The question of **sustainability** must also be examined in the wider context of a growing international awareness of **how much water we consume**, and the increasing concern about water shortages and conflicts between States and regions over access to ever-decreasing water resources. Closely connected with this issue is the accumulating evidence that abstracting significant volumes of water from river systems and lakes in various parts of the world has caused, and is continuing to cause, widespread ecological, social and economic losses and damage."*

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Ethical [Framing]; Considering models of Worldviews

The Four Worldviews

(Annick de Witt)



	Seeks certainty/control	Recognises inherent uncertainty
Materialistic	<p>Modern <i>Associated with:</i> Separation of quantitative and qualitative (prioritizing former). Techno-optimism. Individualistic autonomous self. <i>Certainty and Truth</i> through: objective rationality via Reductionist Science</p>	<p>Postmodern <i>Associated with:</i> Deconstructivism, Scepticism Ineliminable Uncertainty, Relativism Subjective self expression as unique being No Certainty, No Truth: Pluralistic tolerance, diverse, multiple narratives valid</p>
Beyond materialism (spiritual, transcendent, emergent)	<p>Traditional <i>Associated with:</i> Working within natural cycles, bound up with irreducible mystery and enchantment. Community/group & tradition. <i>Certainty and Truth through: Divine order</i> (mediated through sacred texts & customs)</p>	<p>Integrative <i>Associated with:</i> Irreducible complexity, wholeness, ongoing change and emergence. Connectedness with others and world. No Certainty, Truth through: both qualitative and quantitative, spiritual and physical; Integrative Emergent Transdisciplinarity</p>

Consecutive paradigms/ worldviews, based on Byrne (2017, p. 56) after Hedlund-de Witt.

TRANSDISCIPLINARY PERSPECTIVES ON TRANSITIONS TO SUSTAINABILITY
 EDITED BY EDMOND BYRNE, GERARD MULLALLY AND COLIN SAGE

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[Question from de Witt's..] Worldview test;



- A] I feel more like a **citizen of the world** than a citizen of a country
- B] Who I am is **defined by my religion and upbringing**
- C] I feel part of the **vast, interconnected whole** that is **life** and the **universe**
- D] Who I am is defined by my **social position and/or my achievements**



Modern

Postmodern

D] Defined by social position/achievements [11]

A] Citizen of the World [44]

Traditional

Integrative

B] Defined by Religion and Upbringing [11]

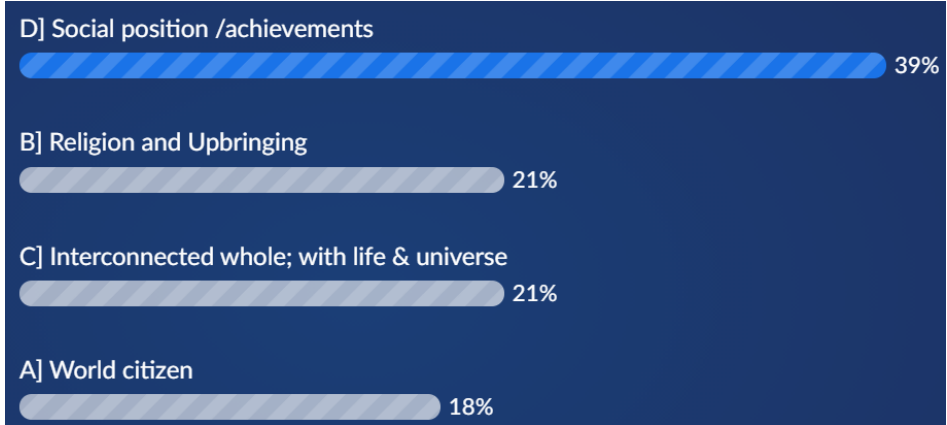
C] Part of Vast, Interconnected Whole of Life and Universe [33]



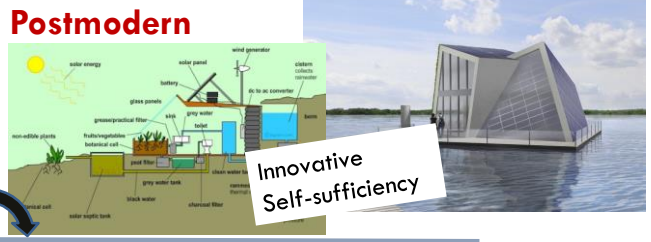


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University College Cork Process & Chemical Engineering 2nd year Student Responses (Oct 2021) (n =33)



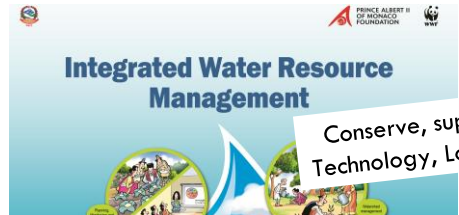
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Traditional



Integrative





Thank you!

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