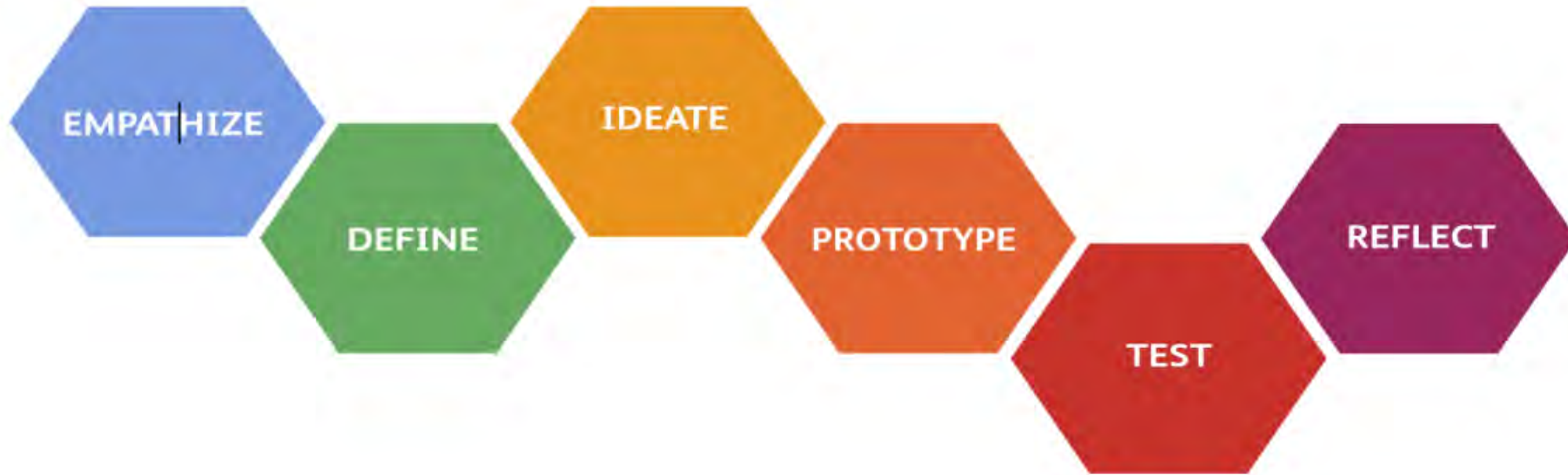




Piezo Plate

Paving the way

Design Thinking Approach





UN Sustainable Development Goals



THE 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT: AN OVERVIEW

#1: END POVERTY IN ALL ITS FORMS EVERYWHERE

#2: END HUNGER, ACHIEVE FOOD SECURITY AND IMPROVED NUTRITION AND PROMOTE SUSTAINABLE AGRICULTURE

#3: ENSURE HEALTHY LIVES AND PROMOTE WELL-BEING FOR ALL AT ALL AGES

#4: ENSURE INCLUSIVE AND QUALITY EDUCATION FOR ALL AND PROMOTE LIFELONG LEARNING

#5: ACHIEVE GENDER EQUALITY AND EMPOWER WOMEN AND GIRLS

#6: ENSURE ACCESS TO WATER AND SANITATION FOR ALL

#7: ENSURE ACCESS TO AFFORDABLE, RELIABLE, SUSTAINABLE AND MODERN ENERGY FOR ALL

#8: PROMOTE INCLUSIVE AND SUSTAINABLE ECONOMIC GROWTH, EMPLOYMENT AND DECENT WORK FOR ALL

#9: BUILD RESILIENT INFRASTRUCTURE, PROMOTE SUSTAINABLE INDUSTRIALIZATION AND FOSTER INNOVATION

#10: REDUCE INEQUALITY WITHIN AND AMONG COUNTRIES

#11: MAKE CITIES INCLUSIVE, SAFE, RESILIENT AND SUSTAINABLE

#12: ENSURE SUSTAINABLE CONSUMPTION AND PRODUCTION PATTERNS

#13: TAKE URGENT ACTION TO COMBAT CLIMATE CHANGE AND ITS IMPACTS*

#14: CONSERVE AND SUSTAINABLY USE THE OCEANS, SEAS AND MARINE RESOURCES

#15: SUSTAINABLY MANAGE FORESTS, COMBAT DESERTIFICATION, HALT AND REVERSE LAND DEGRADATION, HALT BIODIVERSITY LOSS

#16: PROMOTE JUST, PEACEFUL AND INCLUSIVE SOCIETIES

#17: REVITALIZE THE GLOBAL PARTNERSHIP FOR SUSTAINABLE DEVELOPMENT

EMPATHIZE

17 GOALS

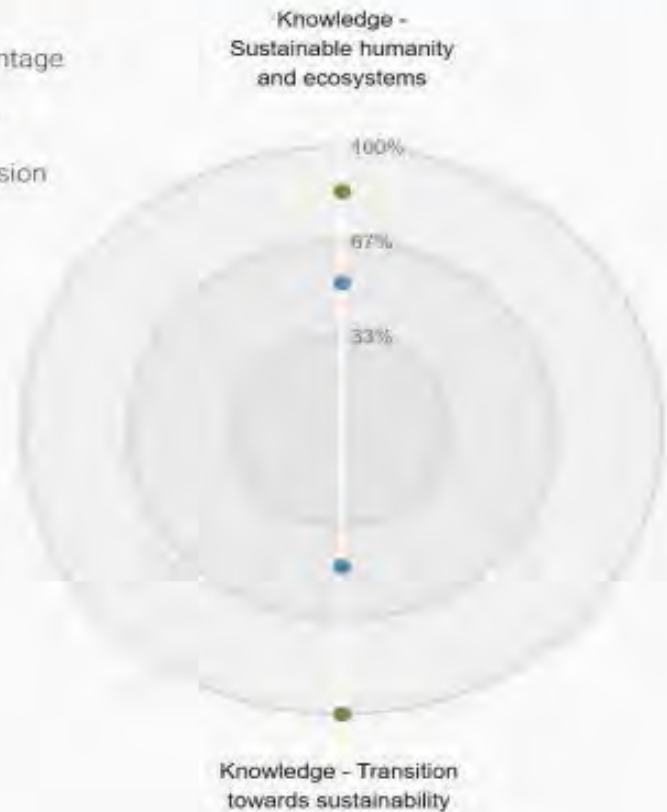
Sustainability Literacy Test



SDG 12 - CIRCULAR ECONOMY (UN ENVIRONMENT)

Legend

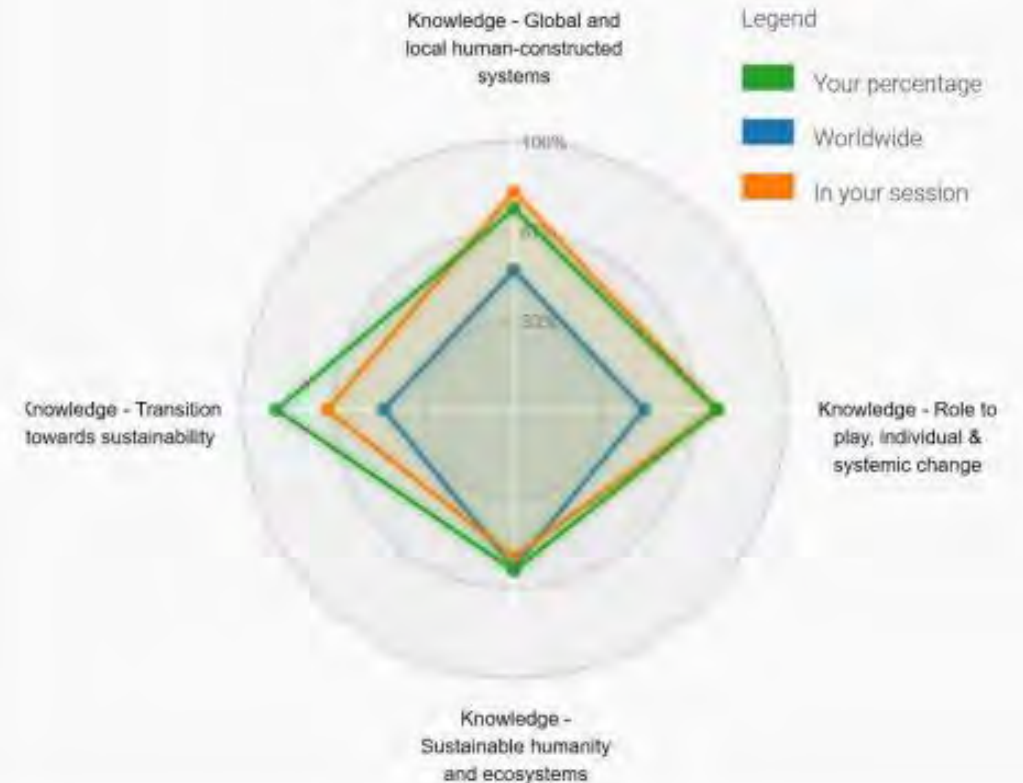
- Your percentage
- Worldwide
- In your session



CORE INTERNATIONAL

Legend

- Your percentage
- Worldwide
- In your session



Motility

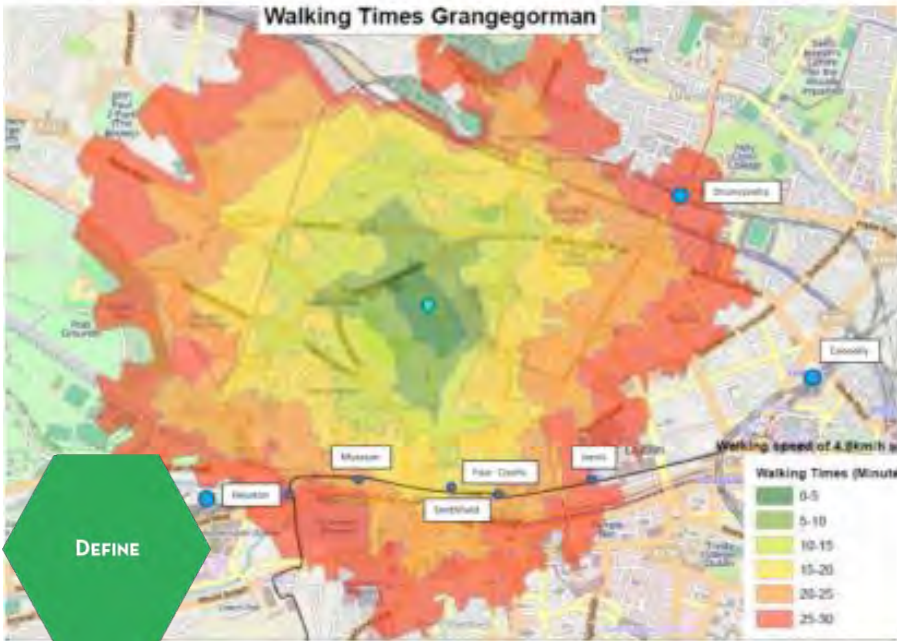
(Kauffman, 2004)

- Access
- Skills
- Appropriation

EMPATHIZE



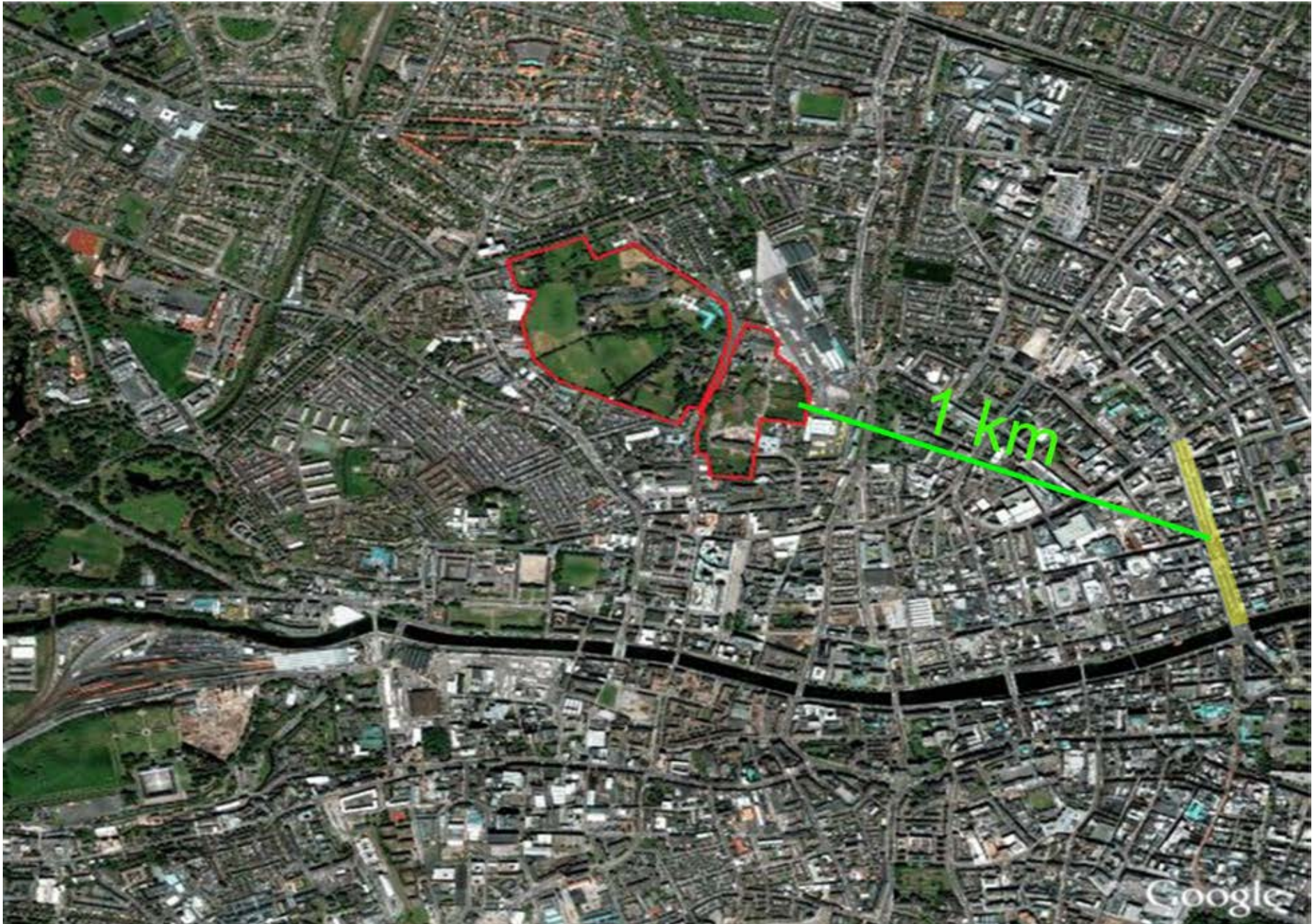




DEFINE

Campus Sustainability

Transport and Mobility







Transport Planning Society

Investment in walking: An overlooked opportunity?

The benefits of investment in policy and infrastructure to encourage walking as a travel mode for short trips is often overlooked. At this event, the work being done by Transport for London to increase walking mode share through the London Walking Action Plan will be presented. More local evidence from Ireland will also be highlighted. Speakers will include:

- Andrew Summers, Transport for London (TfL) Active Travel Lead
- Lorraine D'Arcy, Lecturer at Technological University Dublin
- Elaine Brick, Regional Director at AECOM



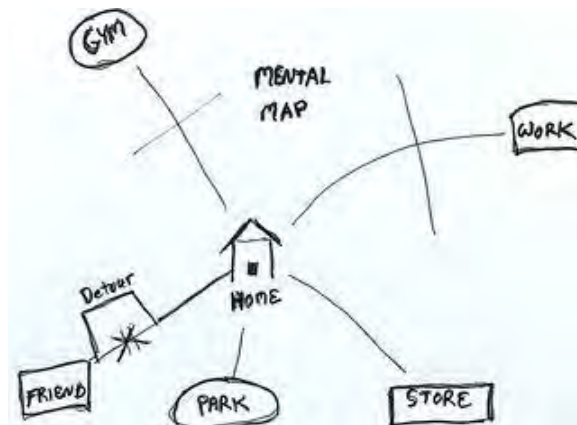
DEFINE



POLYTECHNIC ALLIANCE MOBILITY STUDY

To investigate the behavioral motility patterns of students and staff for each University

- Interview students and staff attending Lucerne Summer School 2019
- Prepare conceptual survey tool for future broader adoption across respective campuses
- Research paper as grounds for a mobility database



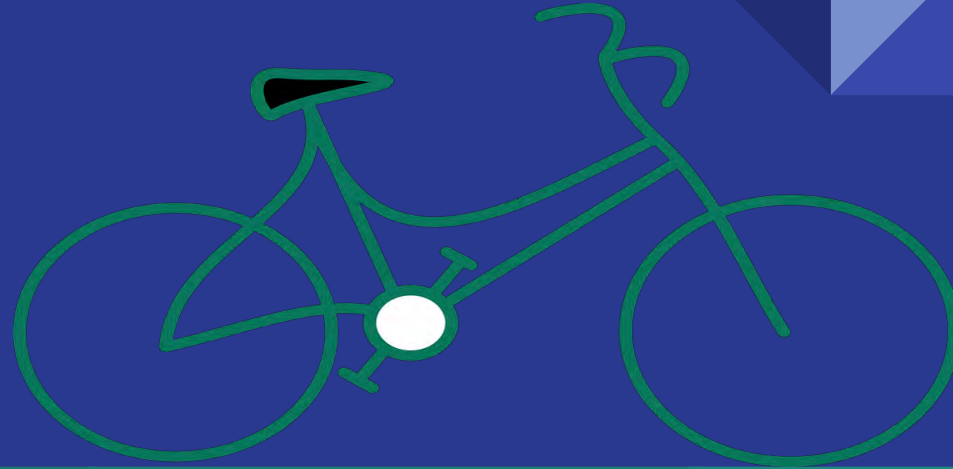
TU DUBLIN INTERCAMPUS MOBILITY

To identify a possible restructuring of existing resources and propose a sustainable network of intercampus transit

- Create a curriculum map for TU Dublin's 3 campuses
- Identify possible greenways for intercampus transit
- Data analysis of on-campus activity for smart mobility



Pedal Points



Sign up for Program

Receive bike sensor

Pedal

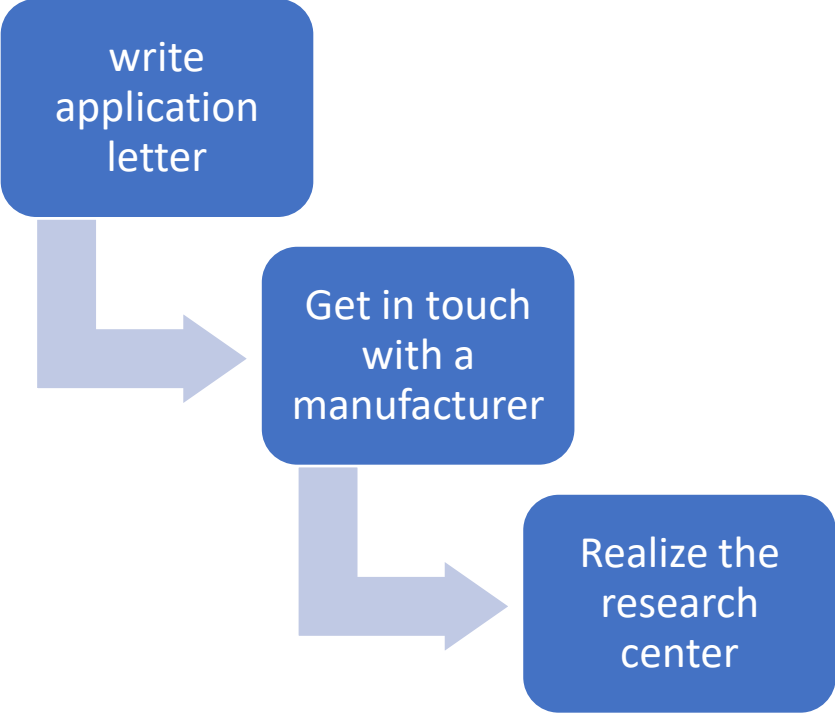
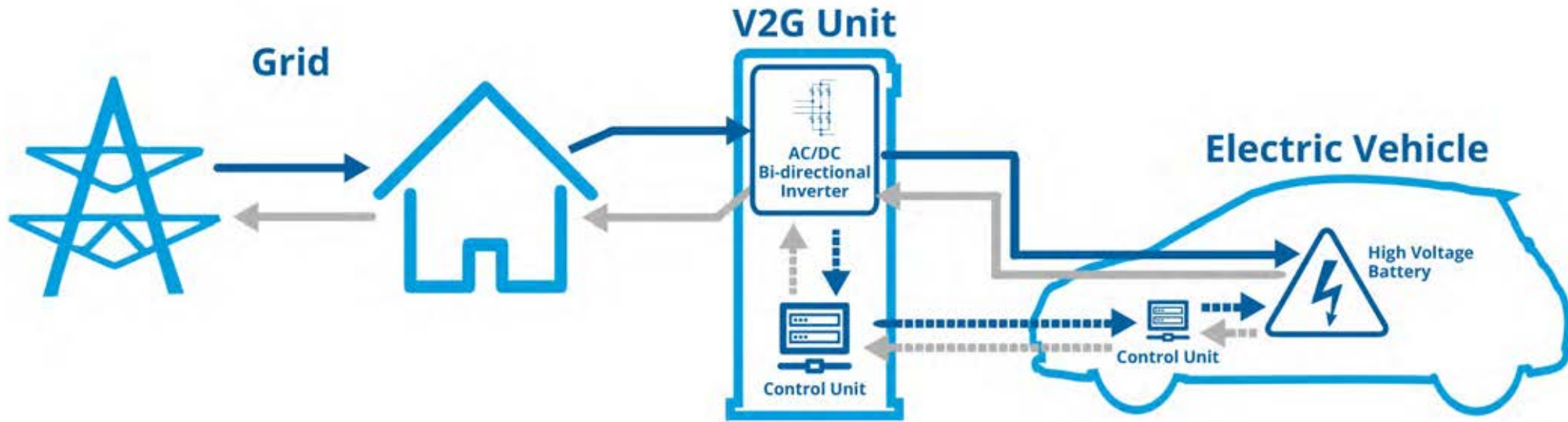
Earn points

Advertise through tabling, chalking sidewalks, social media

Once signed up, receive bike sensor/encoder that keeps track of distance covered.

Pedal to campus, pedal home, Pedal around

The more you pedal the more points you receive. Points can be redeemed for coupons, gadgets, school apparel. Compete with friends, and earn pedal master title (along with trophy)



Piezoelectric tiles

- Technical project, compliments our academic background.
- Involves architectural design thinking.
- Promotes active mobility.



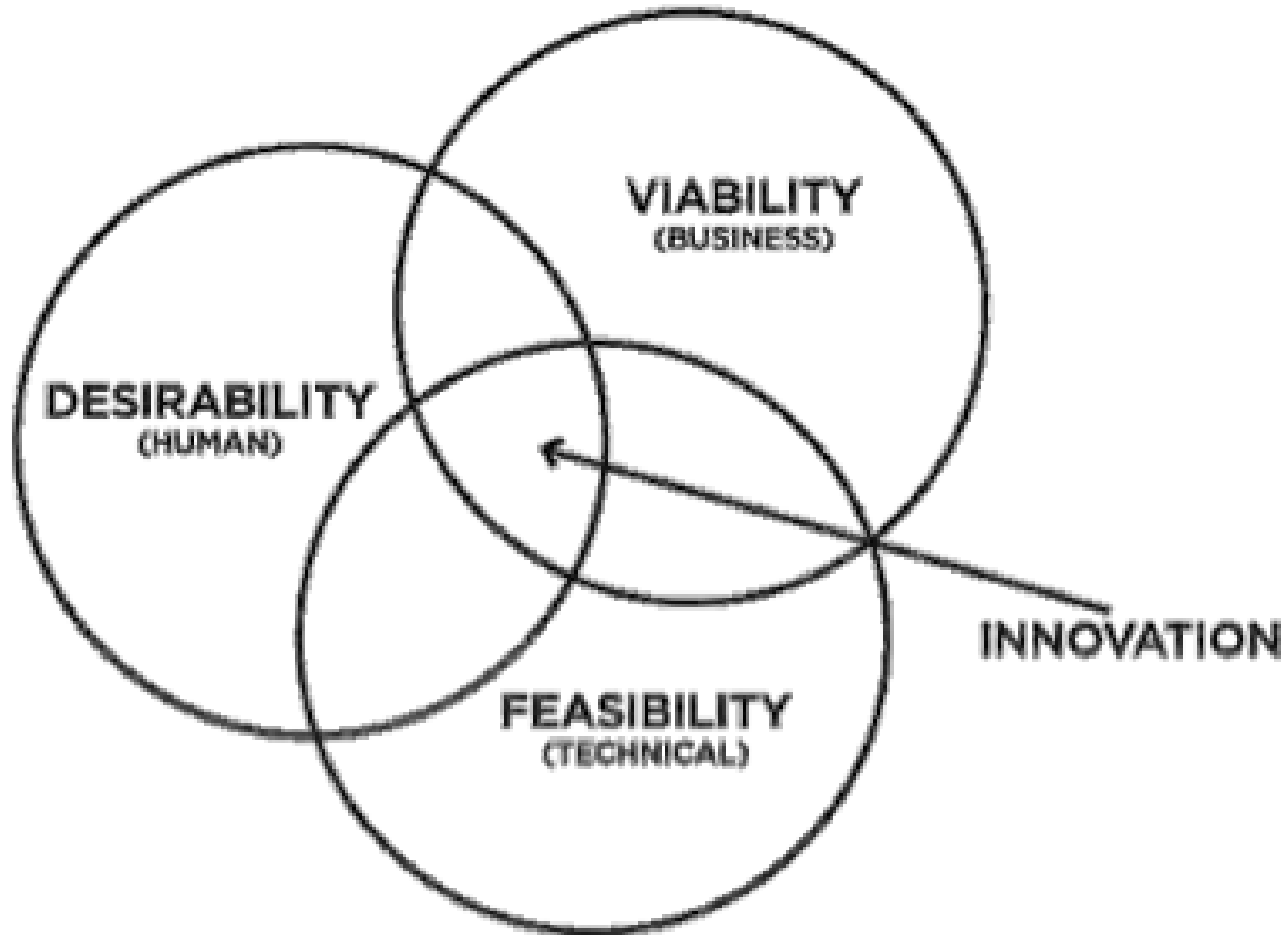
App. to improve transport services

- Interlink students, public transport services and Universities.
- Allow data transfer to improve services based on student timetables.

	9:00 - 10:30	10:45 - 12:15	12:20 - 14:35	14:35 - 16:05	Students can be called in till 16:30
MONDAY	A	B	Yr 1 C Y2 Lunch 12:20 - 13:00	Y1 Lunch 13:50 - 14:35 Yr 2 C	D
TUESDAY	E	F	Yr 1 A Y2 Lunch 12:20 - 13:00	Y1 Lunch 13:50 - 14:35 Yr 2 A	B
WED	B B Int 11:00 - 11:15	F 11:20 - 12:45	F Int Lunch 1:15 - 2:00	A Int 14:30 - 15:00	A
THURS	E E Int	D 11:15 - 12:45	D Int Lunch 1:15 - 2:00	C Int 14:30 - 15:00	C
FRIDAY	C	D	Yr 1 E Y2 Lunch 12:20 - 13:00	Y1 Lunch 13:50 - 14:35 Yr 2 E	F







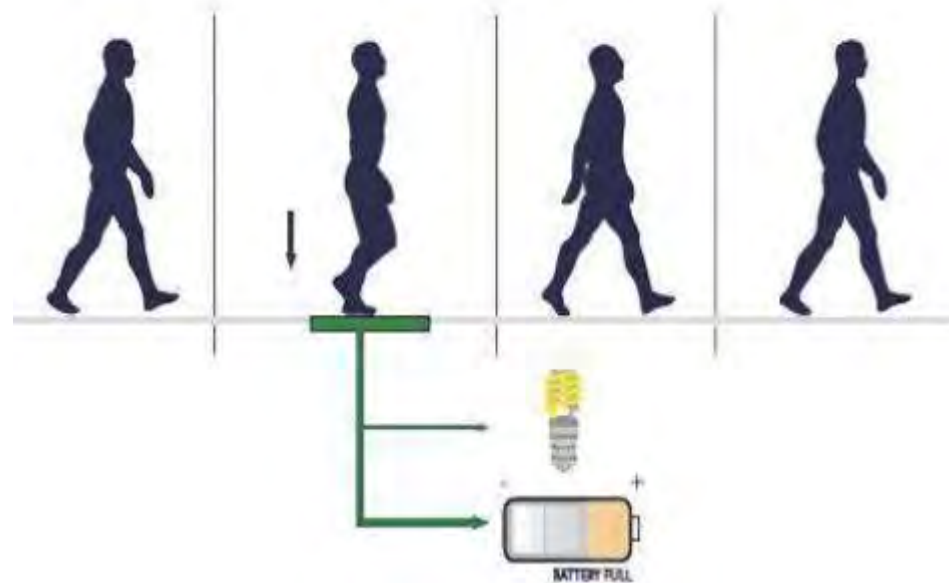


	Piezoelectric Floor	Mobility App	Intercampus	Time Study	Points Scheme	Solar EV Charging
Desirability	3	3	2	1.5	2	2.5
Feasibility	3	3	3	3	2	3
Viability	3	2.75	3	2.5	2.5	2.5



Project Objective Statement

"To investigate the feasibility of using energy-harnessing footfall generators, as a means of promoting motility"



A modern urban courtyard featuring a paved walkway with a geometric pattern of dark grey and black tiles. The walkway is bordered by vibrant green artificial grass. On the right side, there is a row of colorful, triangular structures with teal and pink frames and frosted glass panels. In the background, a multi-story building with a mix of brick and glass facades is visible. Several people are walking along the path, and a black lamppost stands on the left side.

<https://www.facebook.com/MidlandsBBC/videos/349561865881054/>





01_introduction



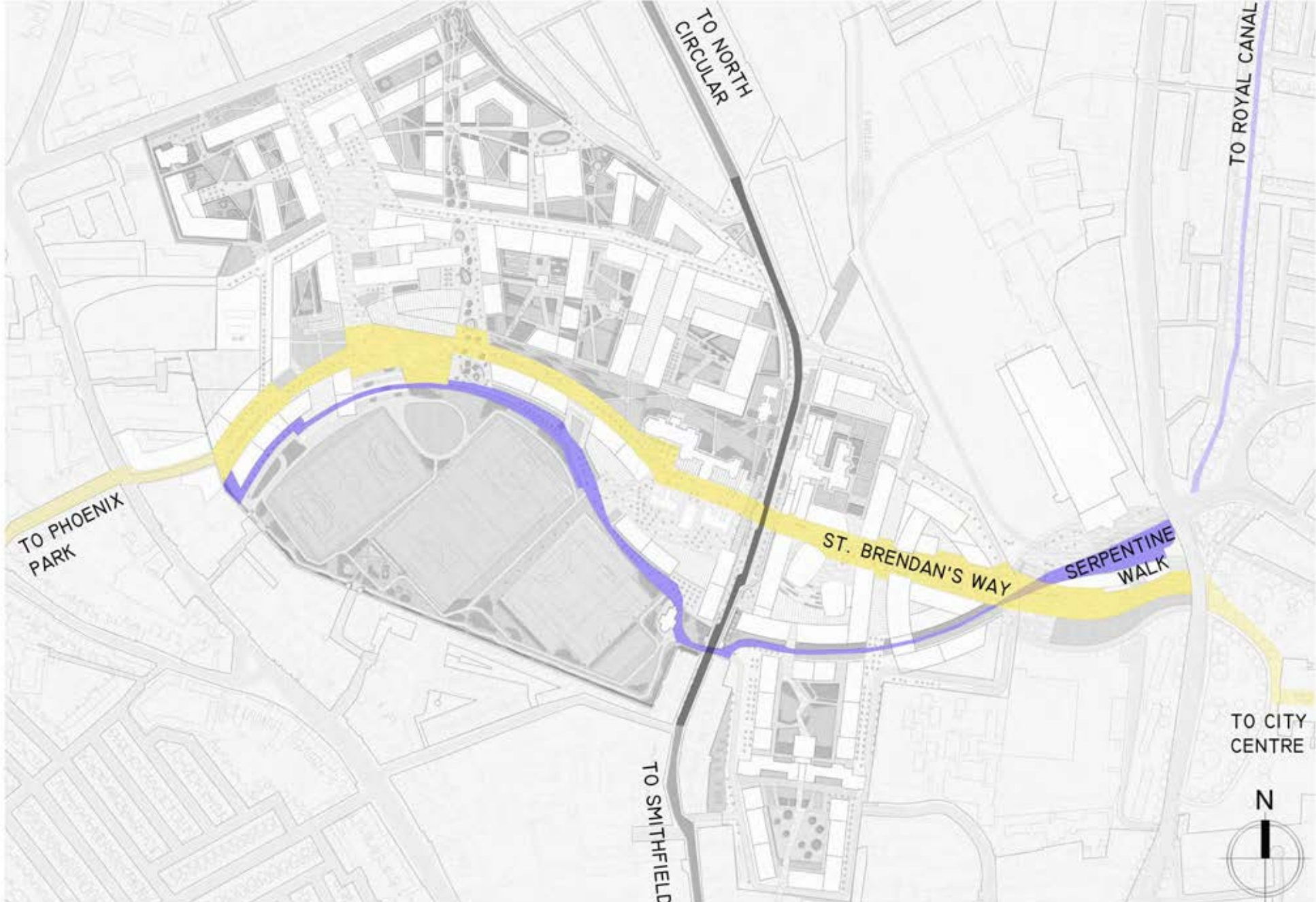
02_masterplan design concept



FINGERS CONCEPT



PRIMARY ROUTES



PEDESTRIAN NETWORK



BROADSTONE



1) PROPOSED RENDER
3) EXISTING AERIAL

2) PROPOSED PLAN
4) BOTTLENECK



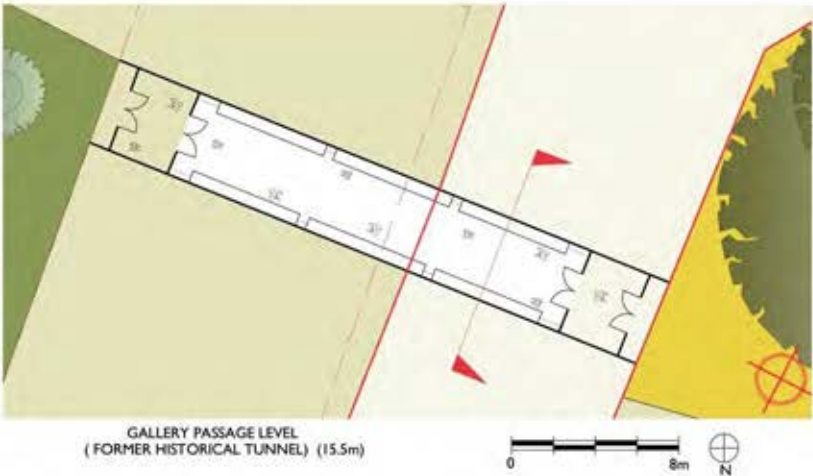
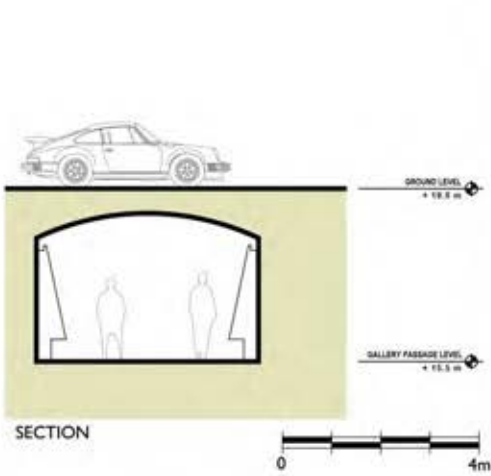
gallery passage

The existing tunnel under Lower Grangegorman Road has been part of the fabric of the Grangegorman site for many years. During this time, it has accommodated the movement of people, clients and users between the west and east parts of the site.

The Masterplan seeks to incorporate this tunnel as part of the new history of the Grangegorman Urban Quarter, by proposing its transformation into a future "Gallery Passage" hosting permanent and temporary exhibitions. Similar to the Cultural Garden, this well-lit space can provide an important connection to the culture, spirit and history of the place. The gallery would have certain hours of operation and would be attendant supervised.

The future exhibitions in this space can cover a wide range of topics related to the Grangegorman site, DIT, HSE, and the surrounding community, including the following:

- History of the Grangegorman site.
- History of DIT.
- History of HSE in Dublin.
- More information on the mission, goals or various departments of HSE or DIT.
- Artwork by DIT instructors, staff or students.
- Artwork by HSE clients and users.
- Artwork by members of the surrounding community.





Market Comparison

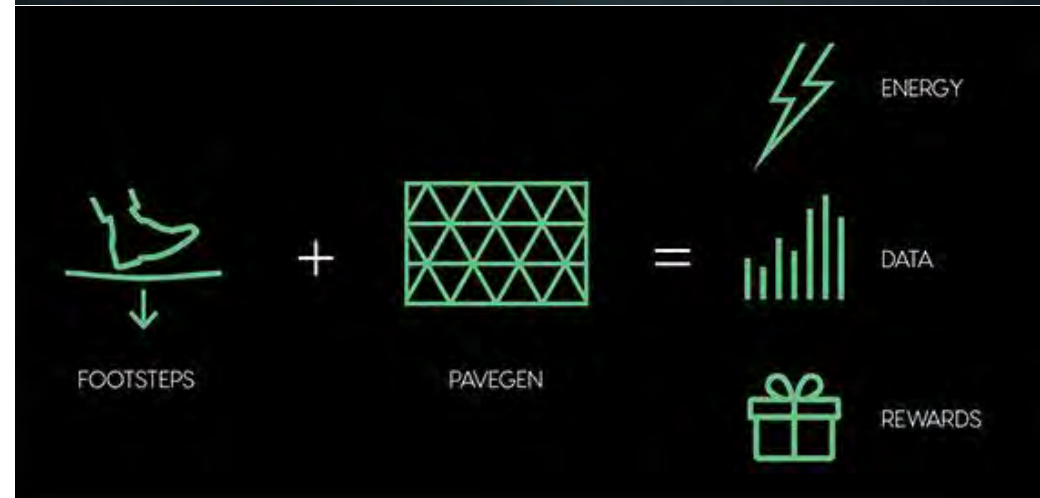
ENERGY FLOORS

Veranu	Energy Floors	PaveGen
Piezoelectric crystals	Solar PV	Linear Flywheel Generator

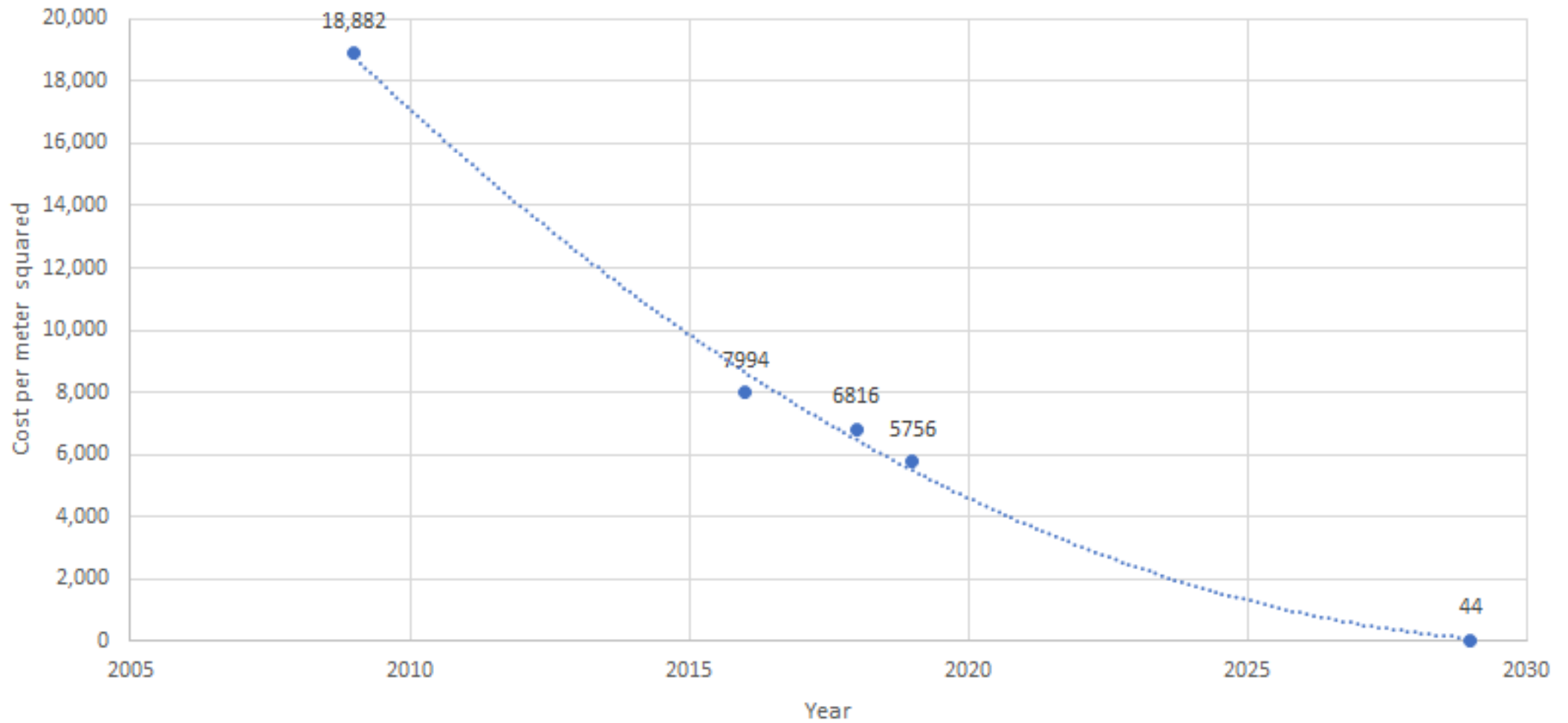


Some Technical Thinking....

- Linear generator technology.
- Triangular tiles to optimise energy distribution.
- Single footstep can produce 5 Watts.
- Power an LED for 30 seconds.
- Stored in batteries, can be used at night to light the way.
- Data collection to further the study of motility.



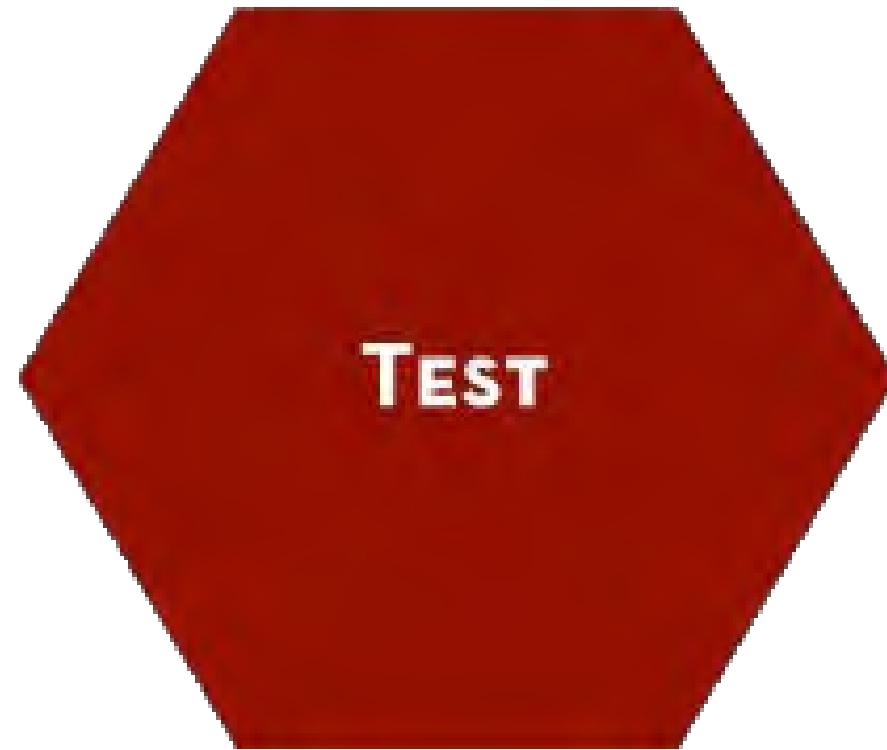
Previous and forcasted prices of PaveGen/ m² (€)





- Prices are decreasing rapidly
- Evidence that R&D is still required
- PaveGen has targets set

PROTOTYPE



Stride Test

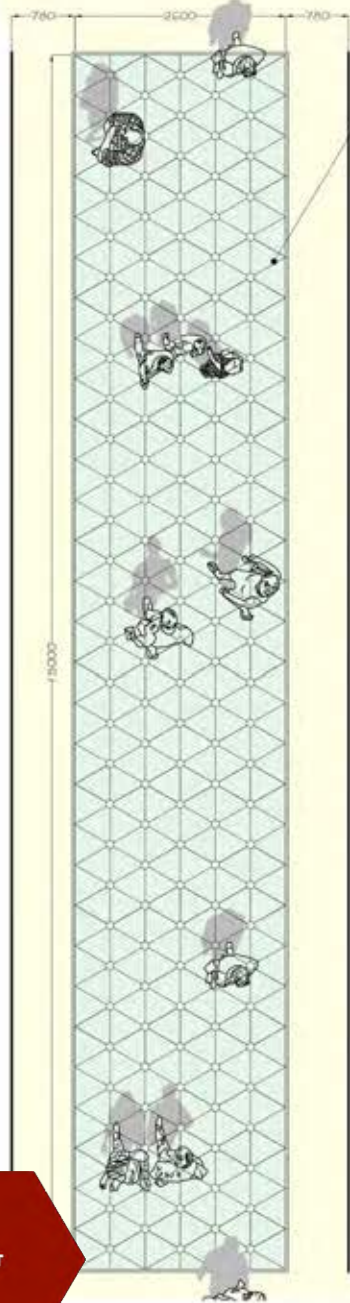
- 15 metre strip
- Walk in a straight line
- Count steps
- Repeat

Results:

Average of 21 steps.

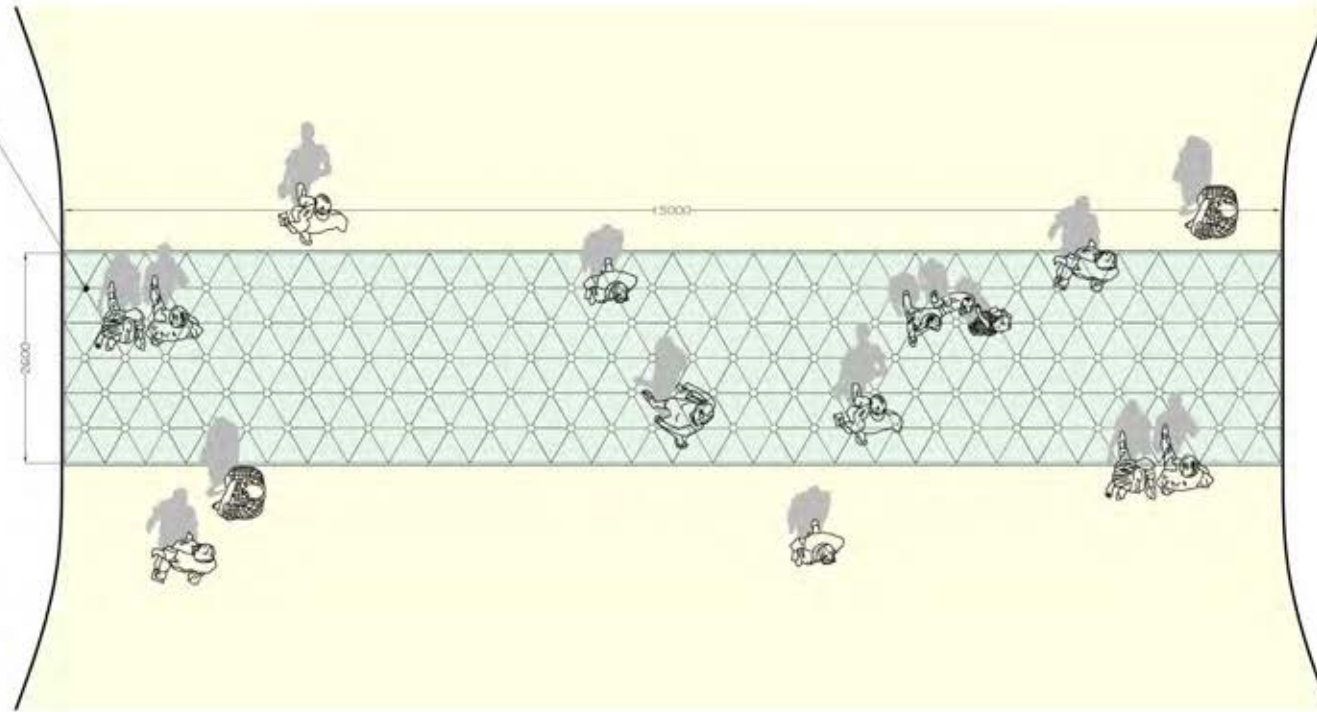
TEST





GALLERY PASSAGE
TUNNEL -
SERPENTINE WALK.

BROADSTONE
BOTTLENECK.



Gallery Passage

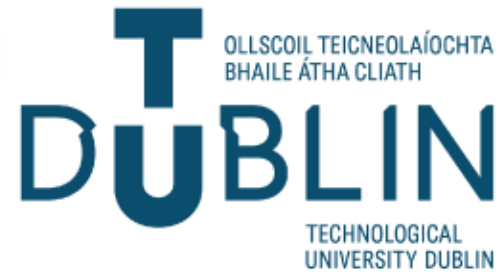
People	Avg. Steps	Joules per step		
7500	21	4	175	Watt hours
10000	21	4	233	Watt hours
15000	21	4	350	Watt hours

Broadstone

People	Avg. Steps	Joules per step		
20000	3.6	4	80	Watt hours
25000	3.6	4	100	Watt hours
30000	3.6	4	120	Watt hours

TEST

Conference Call with Sustainability Director Andy Maguire



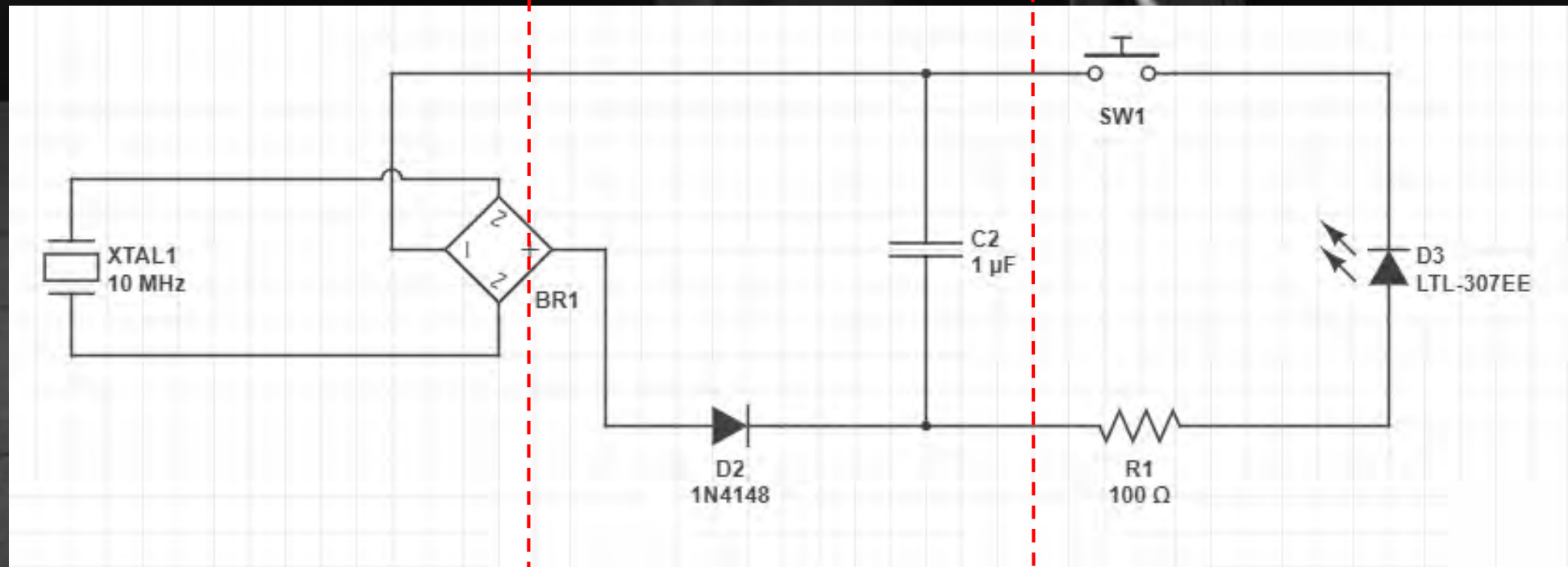
- Location, location, location!!
- SEAI Application
- Social Aspect
- Economics

Design

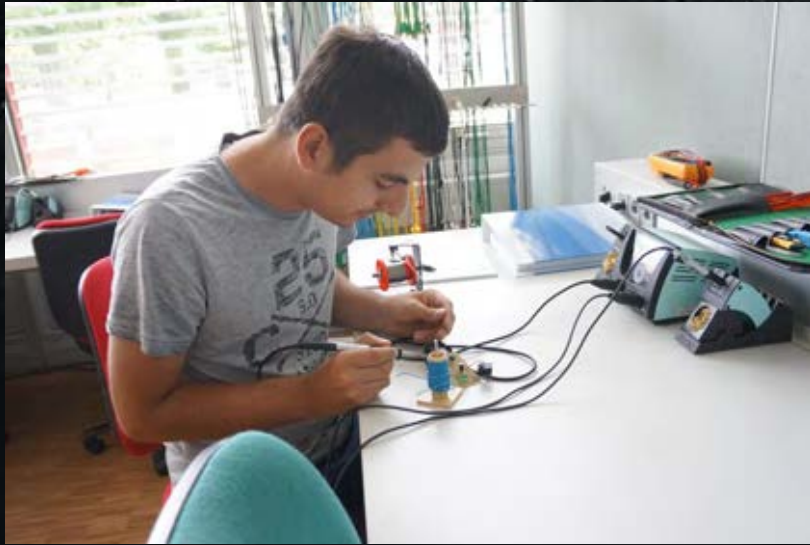
Harnessing Circuit

Loading Circuit

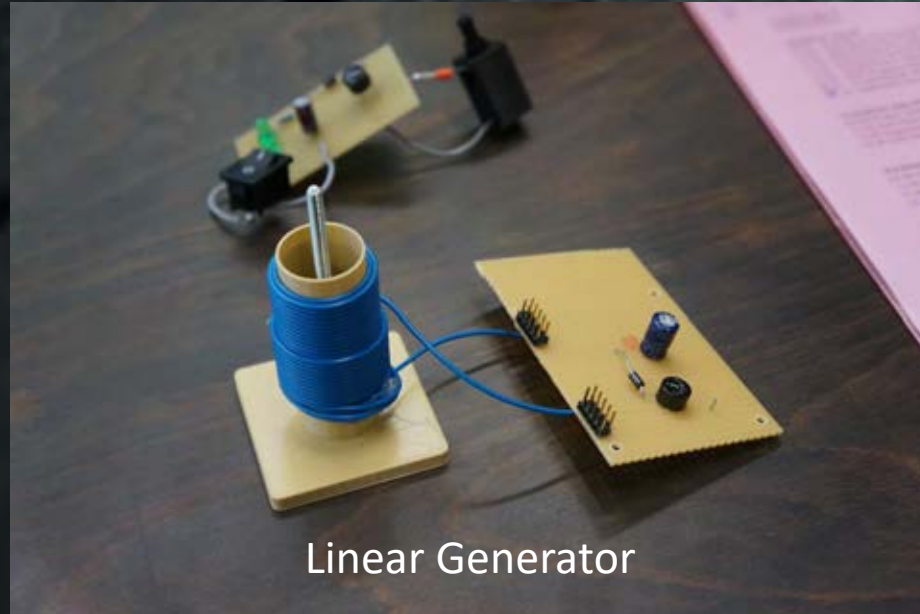
Storing Circuit



Construction



Piezoelectric Generator



Linear Generator

Findings

- Piezoelectric method generates more energy

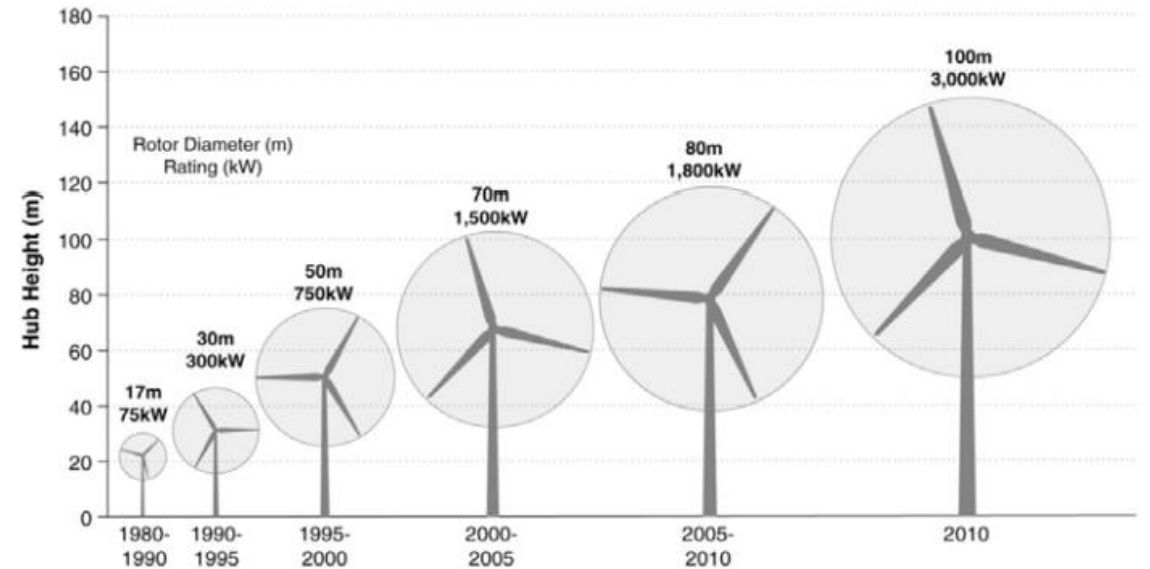
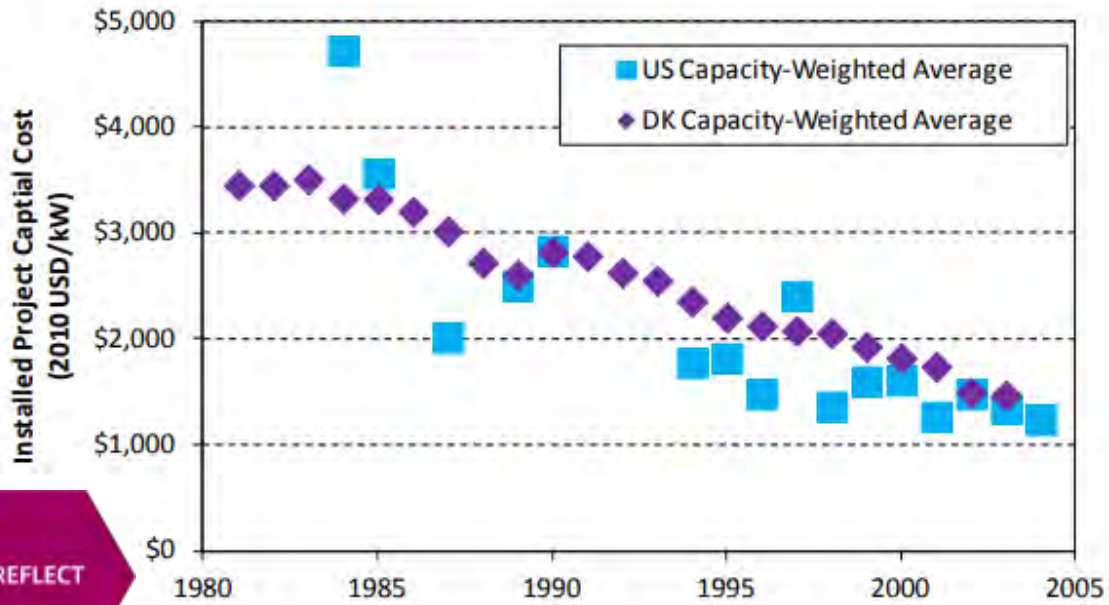
Piezo	Linear Gen
0.8 V	0.001 V

- Piezoelectric lifespan is much shorter than Linear Generators
- Linear Generators are cheaper
- Inefficient components for prototype



Conclusions

- Not ready for commercial production.
- Cost is inversely proportional to efficiency, Just like wind turbines and solar PV panels historically.
- Compliments Grangegorman's sustainable mobility strategy.
- Axial positioning is vital for optimum energy harnessing.





**Thank you for
listening.**