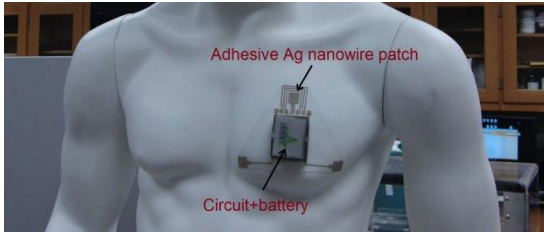


Sustainability as a Strategy and Pushing the Boundaries of the Box

Dr. Ali Muhtaroglu

Director, Center for Sustainability
Faculty Member, Dept. of Electrical-Electronics Engineering
METU Northern Cyprus Campus

GODEC, Kyrenia, TRNC
October 4th, 2019



21 issues for the 21st Century – UNEP Foresight Panel

Issue ID	Issue Title
Cross-cutting issues	
001	Aligning Governance to the Challenges of Global Sustainability
002	Transforming Human Capabilities for the 21 st Century: Meeting Global Environmental Challenges and Moving Towards a Green Economy
003	Broken Bridges: Reconnecting Science and Policy
004	Social Tipping Points? Catalyzing Rapid and Transformative Changes in Human Behaviour towards the Environment
005	New Concepts for Coping with Creeping Changes and Imminent Thresholds
006	Coping with Migration Caused by New Aspects of Environmental Change
Food, biodiversity and land issues	
007	New Challenges for Ensuring Food Safety and Food Security for 9 Billion People
008	Beyond Conservation: Integrating Biodiversity Across the Environmental and Economic Agendas
009	Boosting Urban Sustainability and Resilience
010	The New Rush for Land: Responding to New National and International Pressures
Freshwater and marine issues	
011	New Insights on Water-Land Interactions: Shift in the Management Paradigm?
012	Shortcutting the Degradation of Inland Waters in Developing Countries
013	Potential Collapse of Oceanic Systems Requires Integrated Ocean Governance
014	Coastal Ecosystems: Addressing Increasing Pressures with Adaptive Governance
Climate change issues	
015	New Challenges for Climate Change Mitigation and Adaptation: Managing the Unintended Consequences
016	Acting on the Signal of Climate Change in the Changing Frequency of Extreme Events
017	Managing the Impacts of Glacier Retreat
Energy, technology, and waste issues	
018	Accelerating the Implementation of Environmentally-Friendly Renewable Energy Systems
019	Greater Risk than Necessary? The Need for a New Approach for Minimizing Risks of Novel Technologies and Chemicals
020	Changing the Face of Waste: Solving the Impending Scarcity of Strategic Minerals and Avoiding Electronic Waste
021	The Environmental Consequences of Decommissioning Nuclear Reactors



Cross-cutting
Issues

Food,
Biodiversity and
Land Issues

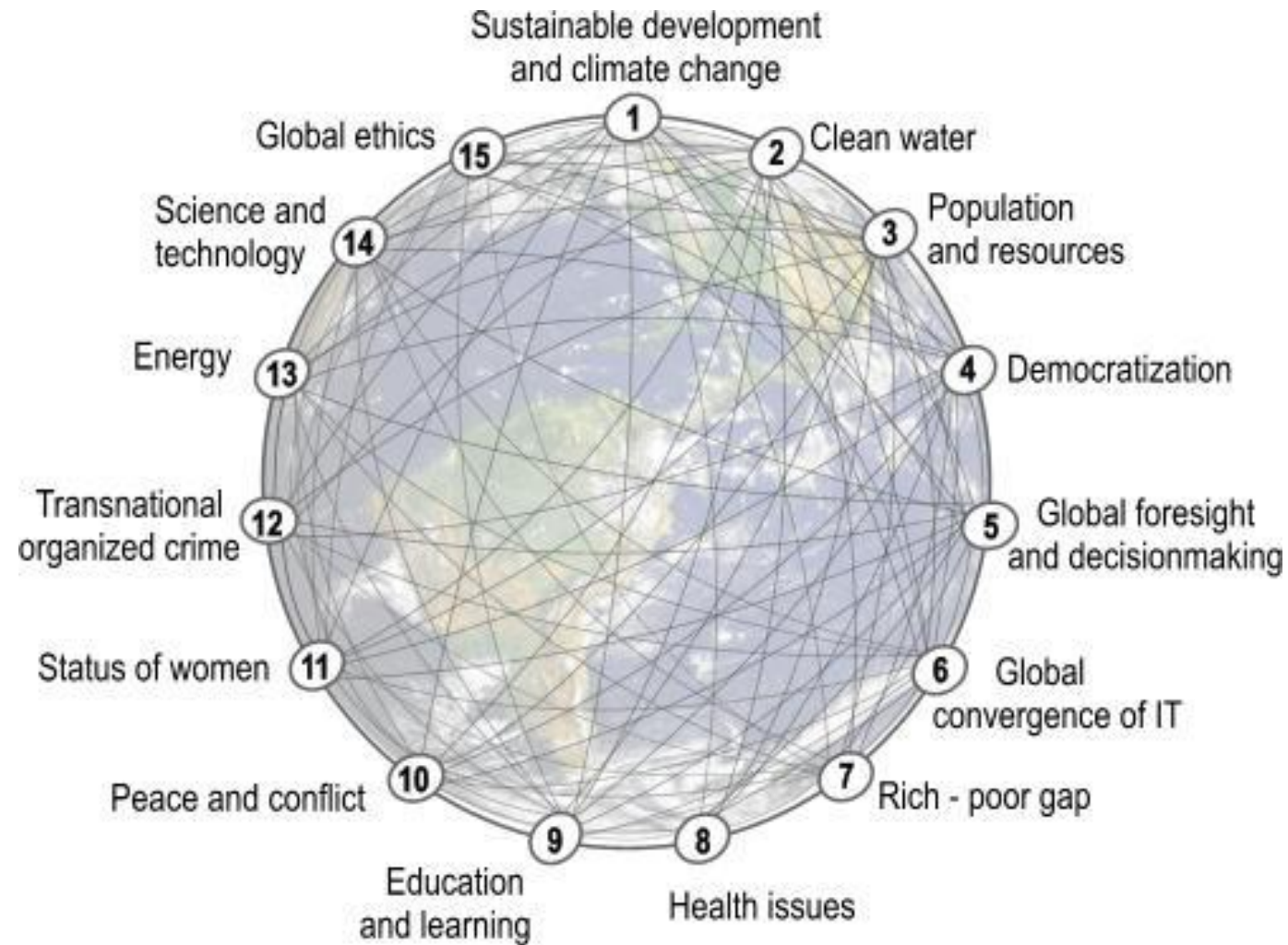


Freshwaters
and Marine Issues

Climate
Change Issues

Energy,
Technology,
and Waste Issues

Global Challenges for Humanity, The Millenium Project



21st Century Challenges, Royal Geographical Society (UK)



Low carbon energy



Climate change



Sustainability



Geoengineering



Overfishing



Plastic pollution in the oceans



Deforestation



Britain's biodiversity



Economic growth



Manufacturing



Education



Gender equality in education

Engineering Grand Challenges by National Academy of Engineering (USA)

1. Make Solar Energy Economical
2. Provide Energy from Fusion
3. Develop Carbon Sequestration Methods
4. Manage the Nitrogen Cycle
5. Provide Access to Clean Water
6. Restore and Improve Urban Infrastructure
7. Advance Health Informatics
8. Engineer Better Medicines
9. Reverse-Engineer the Brain
10. Prevent Nuclear Terror
11. Secure Cyberspace
12. Enhance Virtual Reality
13. Advance Personalized Learning
14. Engineer the Tools of Scientific Discovery



Problems

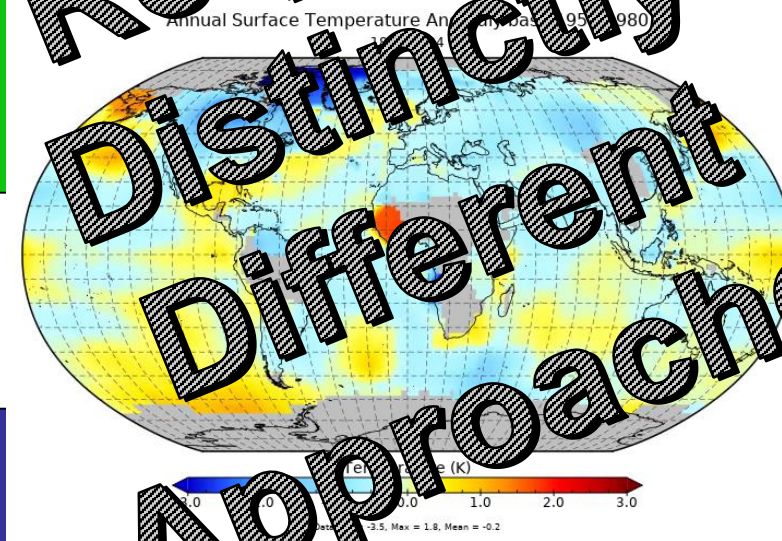
Energy, Environment,
Global Warming,
Sustainability

Vulnerability to
Human and Natural Threats

Medicine and
Healthcare Delivery

Human Capability
and Standard of Living

Requires
Distinctly
Different
Approaches

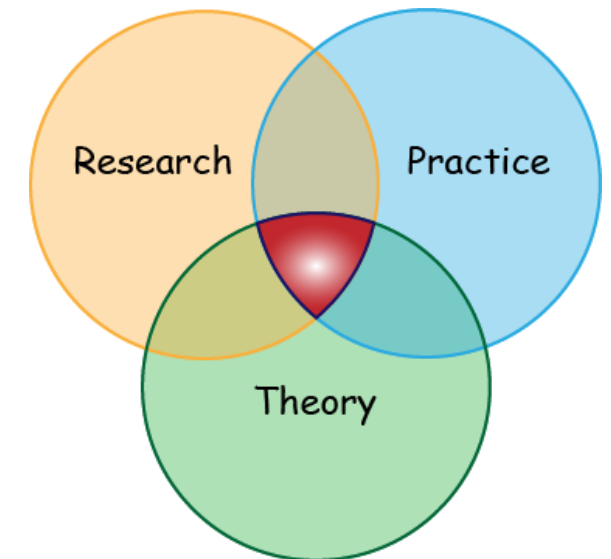


Trends & Opportunities



- Technology enables instantaneous knowledge sharing and seamless collaboration
- Theory-practice-research boundaries getting blurry
- Opportunities to reorganize to lead in problem solving

PEOPLE **CONNECTED**



Progress

2008

- Proposal development for an MS program in Sustainability
- Renewable Energy Design and Applications Research



2010

SEES MS program accepts first students



2012

Green Brain Contest
Green Campus Initiative develops



2015

Efforts start to organize SEES research under interest groups

2017

Center for Sustainability



2018

Multidisciplinary Engineering System
Design/Implementation
(Capstone Project Course)

ESC 491 - 492



MS in Sustainable Environment & Energy Systems



ORTA DOĞU TEKNİK ÜNİVERSİTESİ
MIDDLE EAST TECHNICAL UNIVERSITY
KUZAY KIBRIS KAMPUSU ♦ NORTHERN CYPRUS CAMPUS

Interdisciplinary, International

Application base
from 30 countries
and 30 disciplines

Competitive with
top 15% admitted
with Assistantship
or Scholarship
Award

Research Emphasis

Vital Triad Theme:
Environment, Energy,
Water Resources.

Projects supported by
Campus Research
Fund (BAP), TÜBİTAK,
Intel

Averaged 2
international
publications per
student

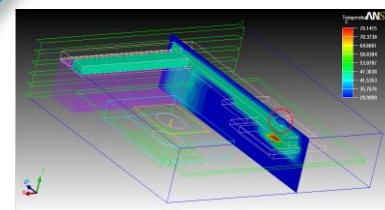
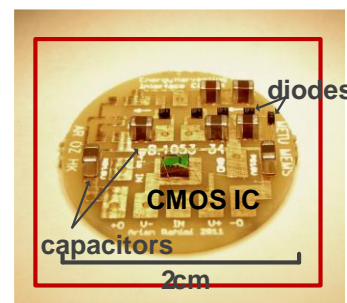
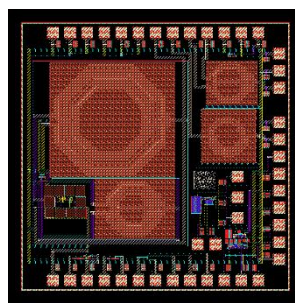
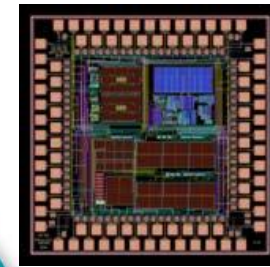
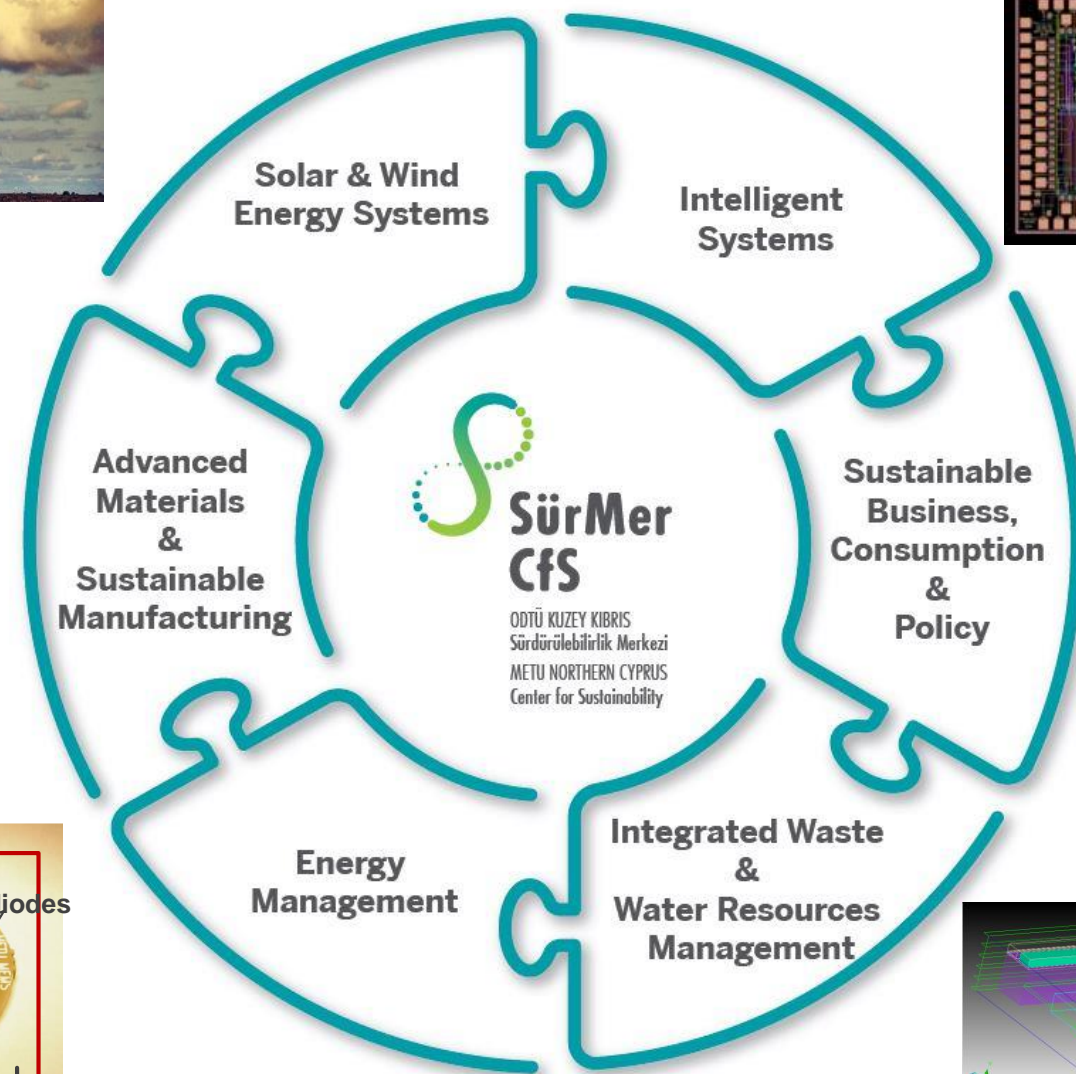
Social Responsibility

Green Brain Contest
among 271 teams,
17 countries in 2014

Government
Renewable Energy
Executive Committee

Government Energy
Efficiency Action
Committee

Green Campus
Initiative



Coordinator:
Dr. Murat Fahrioğlu



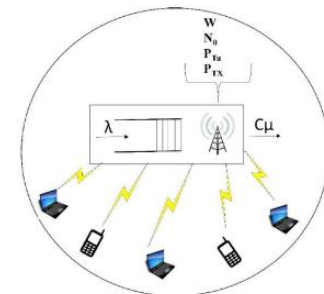
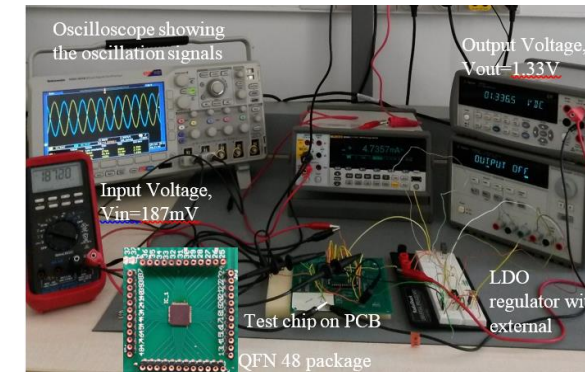
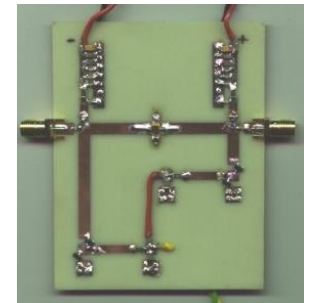
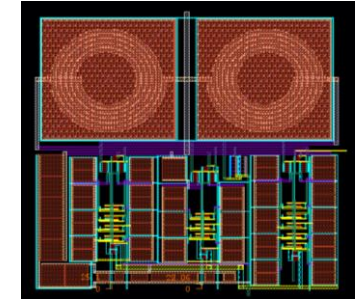
- ❑ Solar Power Station (1 MW PV)
- ❑ EU Standard Wind Tower (60 m)
- ❑ Technical Support to Regulation Framework
- ❑ New solar cell designs
- ❑ Concentrated Solar Power (CSP) Station (Parabolic trough, 120 kW_t)
- ❑ Solar Irradiation Measurement Station (diffuse and direct)



Coordinator:
Dr. Yeliz Yeşilada

- ❑ Internet of Things and efficient wireless sensor networks
- ❑ Human interaction analysis/modelling
- ❑ Low voltage compatible micro-power generators, interface chip design and testing (fabrication in Europe)
- ❑ Amplifier linearization research

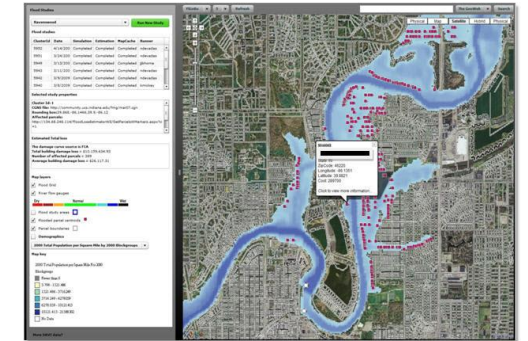
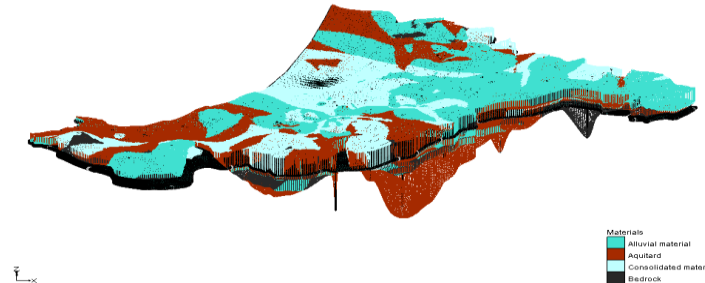
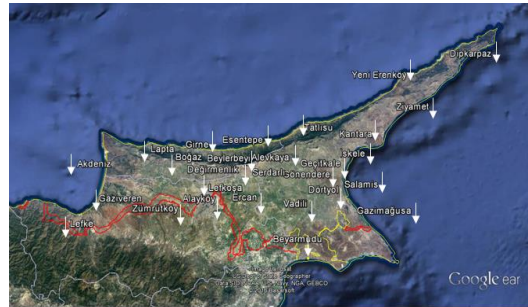
Intelligent Systems



Coordinator:
Dr. Bertuğ Akıntuğ

**Integrated Waste
&
Water Resources
Management**

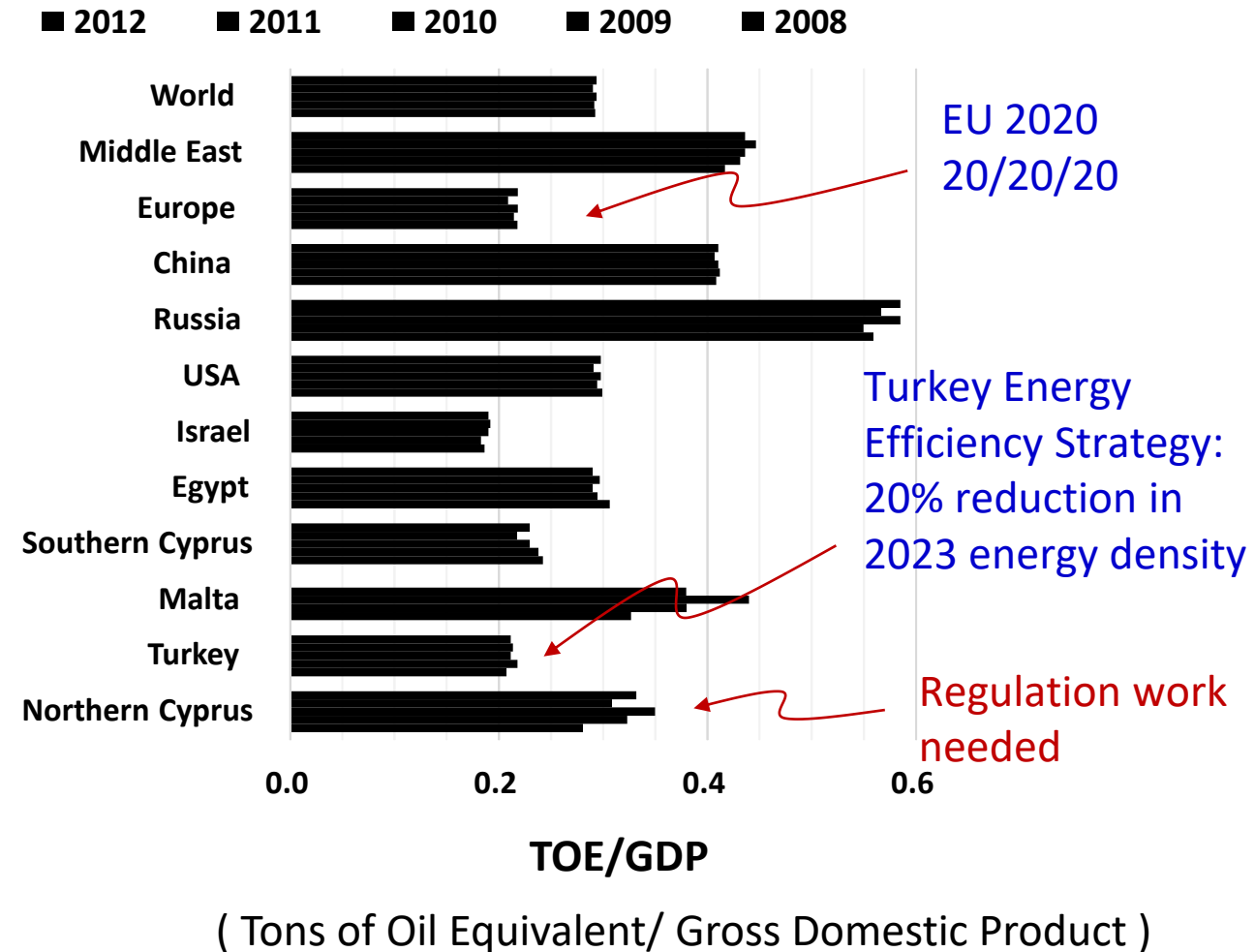
- ❑ Bostancı-Güzelyurt flood analysis and solutions (with Güzelyurt Municipality)
- ❑ Lefkoşa flood analysis (with Lefkoşa Municipality)
- ❑ Modelling of Güzelyurt underground water aquifers (with Department of Geology and Mine)
- ❑ Drought analysis (with Department of Meteorology)
- ❑ Solid Waste Workshop (with Department of Environmental Protection)



Coordinator:
Dr. Murat Sönmez

- Committee contributions to TRNC's first Energy Efficiency Strategy (2015)
- Energy Efficiency industrial training plans within KALTEV

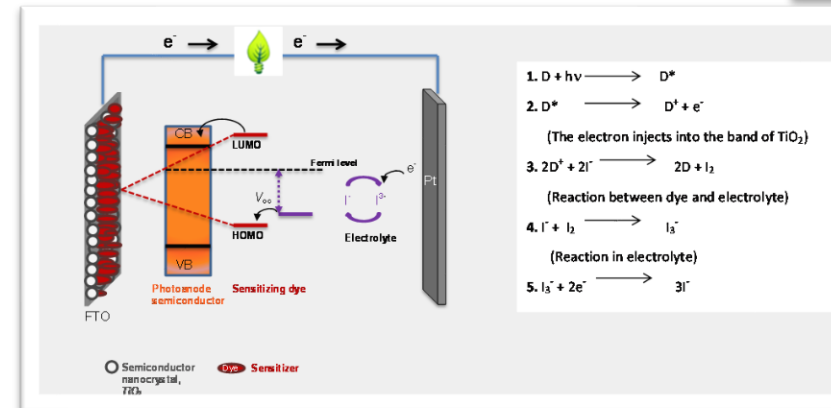
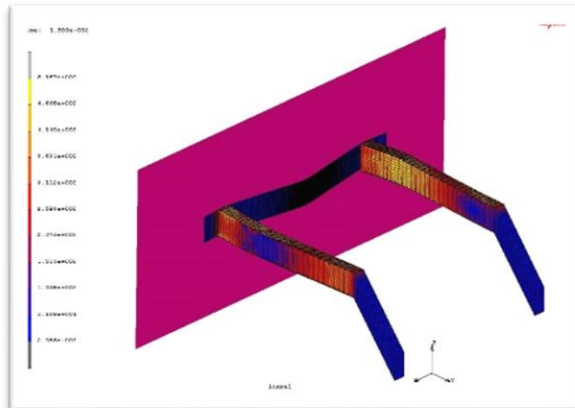
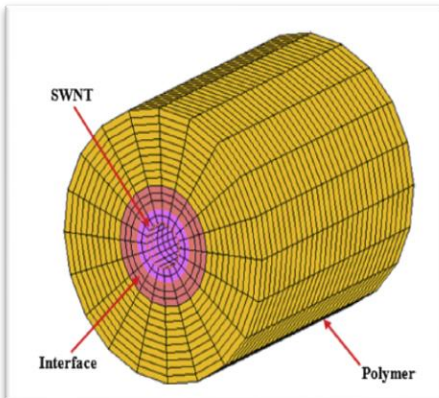
Energy Management



Coordinator:
Dr. Volkan Esat

**Advanced
Materials
&
Sustainable
Manufacturing**

- Development of construction material composites based on waste and pozzolanic materials, as alternative to cement
- Durable materials, solar cells, and absorbers based on graphene, carbon nanotube based metamaterials
- Design and synthesis of functional dye molecules for molecular electronics and photovoltaic applications



Coordinator:
Dr. Carter Mandrik

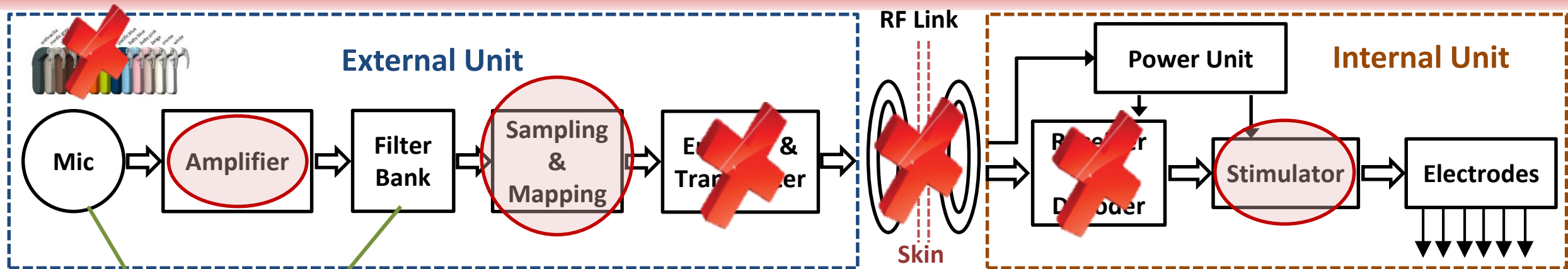


- ❑ Sustainable Marketing
- ❑ Survey based reseach on small and midsize businesses in TRNC
- ❑ Factors affecting knowledge and commercial practices
- ❑ Business adaptation to sustainability
- ❑ Policy development
- ❑ Factors affecting consumer behavior, values, and habits



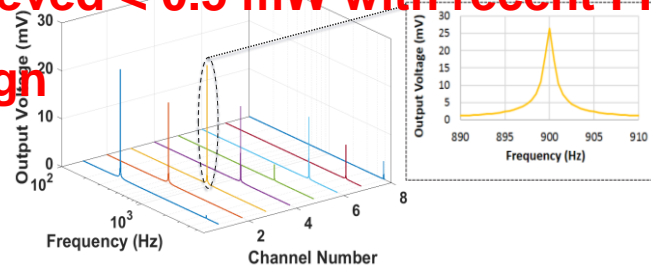
Sample Problem: Implants w/o Batteries

Collaboration with METU MEMS for FLAMENCO Project (ERC-Consolidator grant)

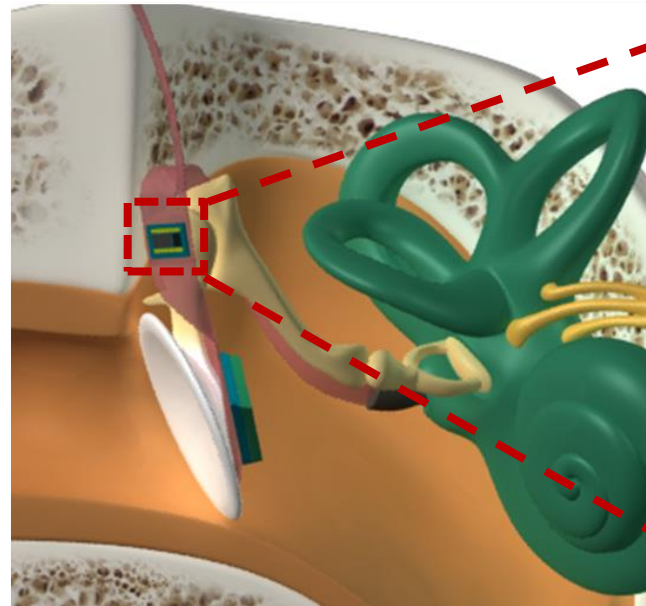


Typical CI Power: ~40 mW

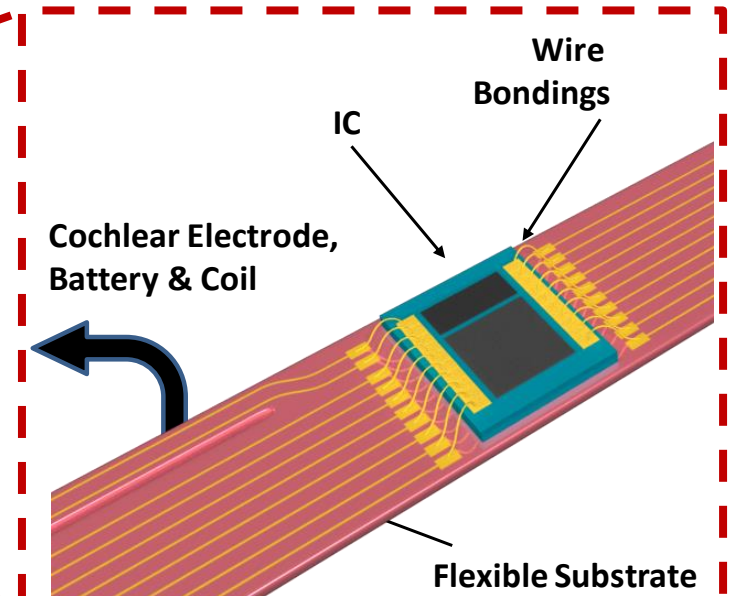
Achieved < 0.5 mW with recent FICI design



PZT Sensor (B. İlik & A. Koyuncuoğlu)



Fully Implantable



FICI Interface

Sample Problem: Wildlife Conservation

Collaboration with Cyprus Wildlife Research Institute (CWRI)



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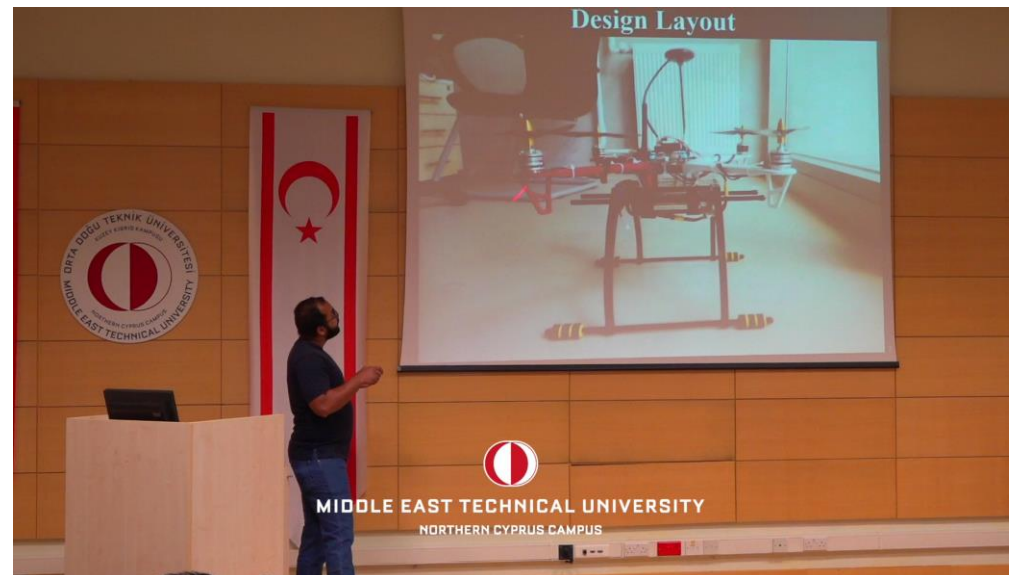
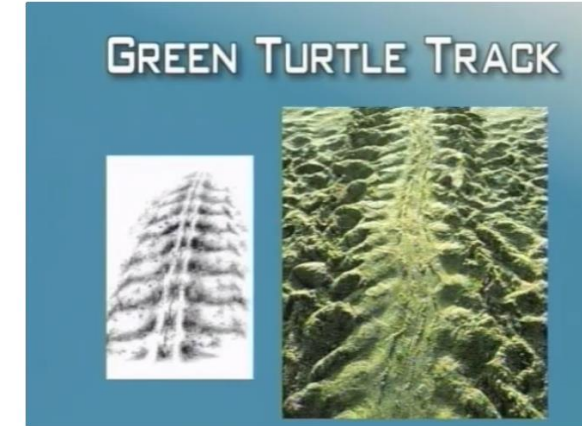
Sea Turtle detection, walking track detection and species identification using drones



Green Turtle
(Confidence 70 %)



Loggerhead Turtle
(Confidence 68 %)





Green Brain

greenbrain.ncc.metu.edu.tr



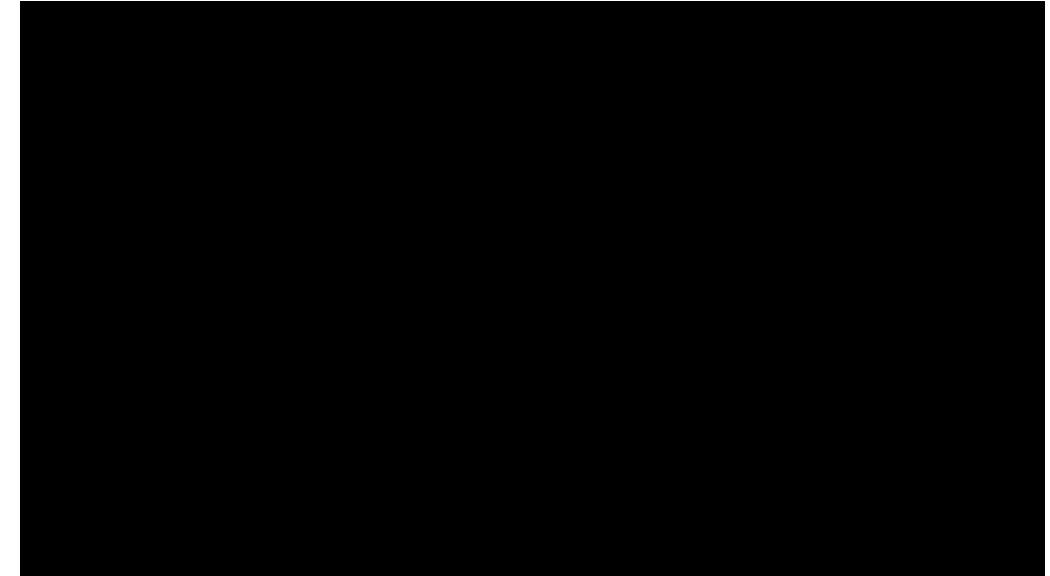
ORTA DOĞU TEKNİK ÜNİVERSİTESİ
MIDDLE EAST TECHNICAL UNIVERSITY
KUZEY KIBRIS KAMPUSU ♦ NORTHERN CYPRUS CAMPUS

- Promote sustainability awareness among high school and university students
- More than 1500 teams competed so far from about 50 countries



2014 winner attracts attention
with YouTube video:

Bill Gates:
“Simple and brilliant”





<http://kalicietki.temizdusun.com/>

- **Think Clean** – TRNC Presidency Environment Project
- **Since 2018:** Promotes awareness of results-oriented strategically planned projects and new ideas for sustainable development:

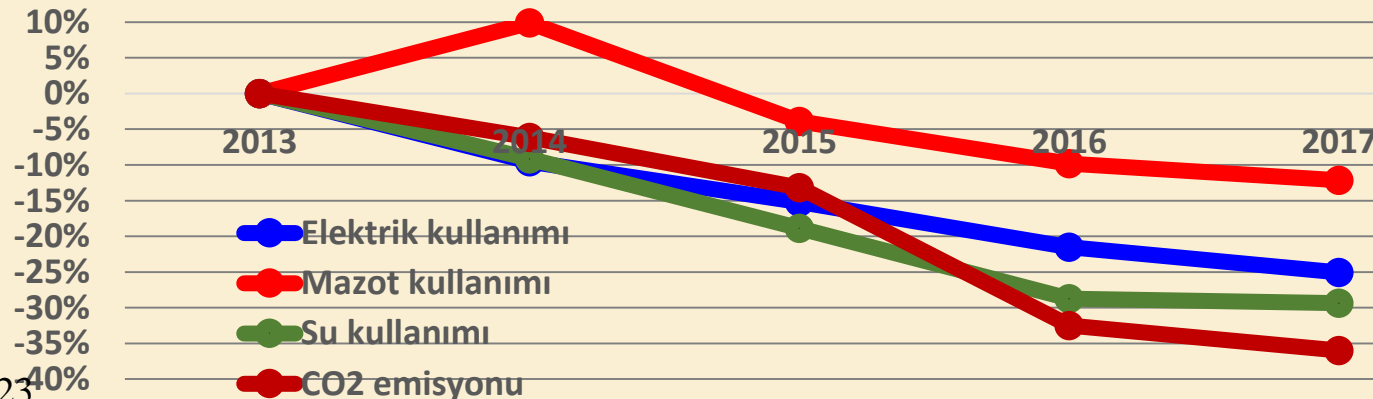
SUSTAINED IMPACT PROJECT CONTEST



Green Campus Initiative



Tüm Değerler 2013'e Göre Kişi Başı % Değişimi Göstermektedir



- ✓ PV Power Plant generated 1800 MW-hr average electrical energy per year; equivalent to the consumption of 590 homes with 4-person family
- ✓ Prevented emission of 2807 tonnes of CO₂, equivalent to what can be absorbed by 57800 trees
- ✓ Generated energy corresponds to about 21% of campus demand

Summary



- Global consensus on grand challenges of 21st century
- Global political will not strong enough or not having the desired impact
- Opportunity to lead through sustainability strategies, cross-disciplinary, cross-sectoral collaborations and out-of-the box ideas, even for “boxed” geographies.
- Need to approach teaching and learning through theory, practice, and research differently





SürMer • CfS

ODTÜ KUZEY KIBRIS Sürdürülebilirlik Merkezi
METU NORTHERN CYPRUS Center for Sustainability

Thank You...