Korea's only innovative growth engine for the environmental industry!

ICT Convergence Environmental Technology Commercialization Mecca

Incheon Innovation Cluster and Collaboration

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Professor, Department of Environmental Engineering, Incheon
National University





General concept of R&BD

- Research & business development
- ***** Review of triple helix model
- **❖** Incheon innovation cluster
- ❖ Korea Central Asia Science & Technology Center
- ❖ INU KOICA Climate / Environment Training Program
- ***** Lesson for environmental R&BD





General concept of R&BD

INNOPOLIS 인천강소특구

Idea Generation

The seeds of innovation are planted

Commercialization

The successful prototype is ready to go to market

The R&D
Life Cycle

Feasibility Analysis

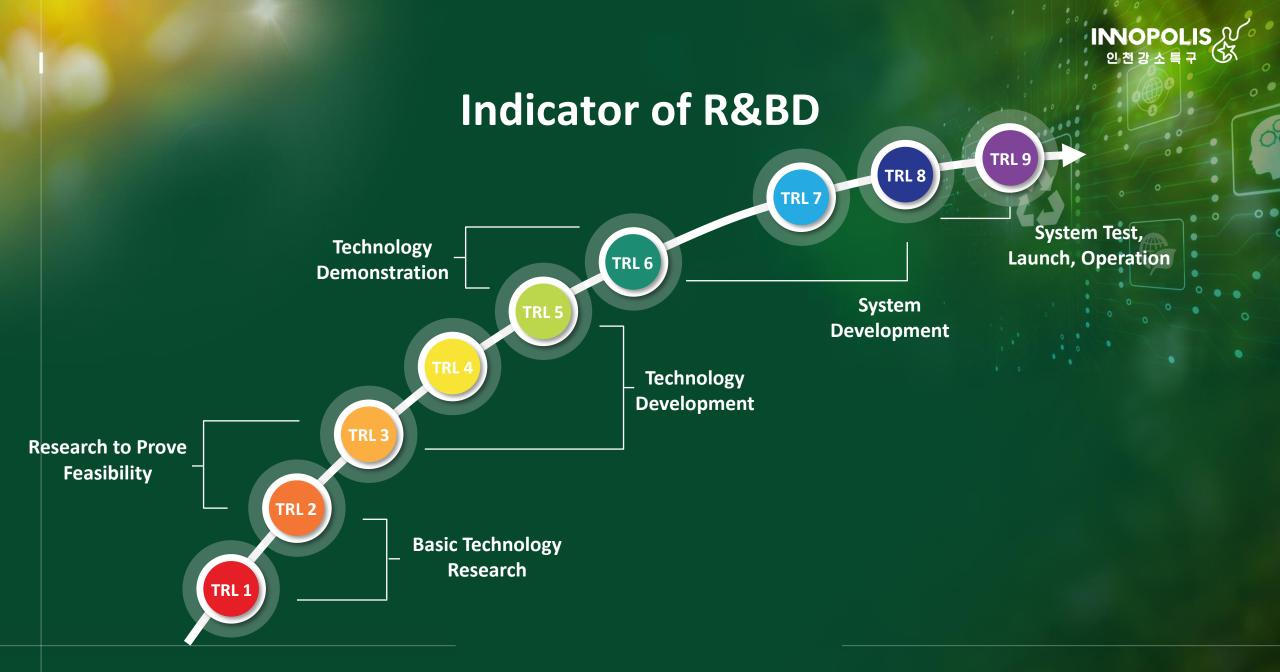
Technical, market, and financial feasibility are assessed

Testing

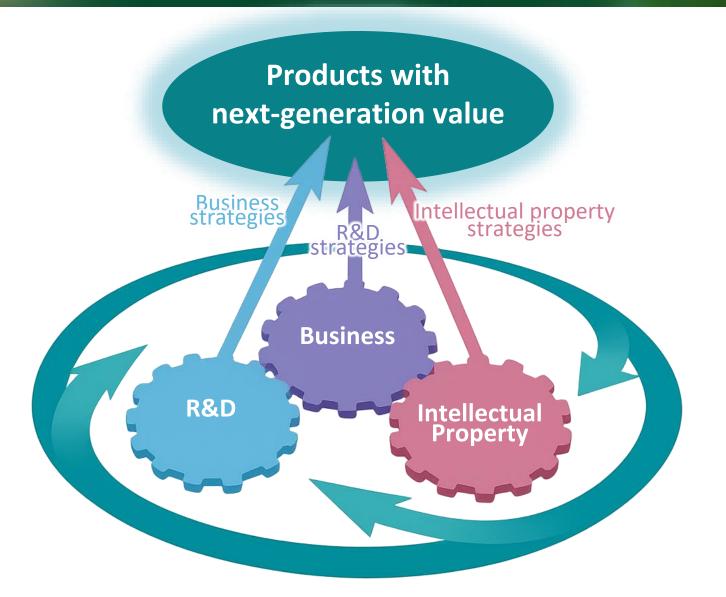
The prototype is rigorously evaluated

Prototype Development

An idea is transformed into a tangible prototype

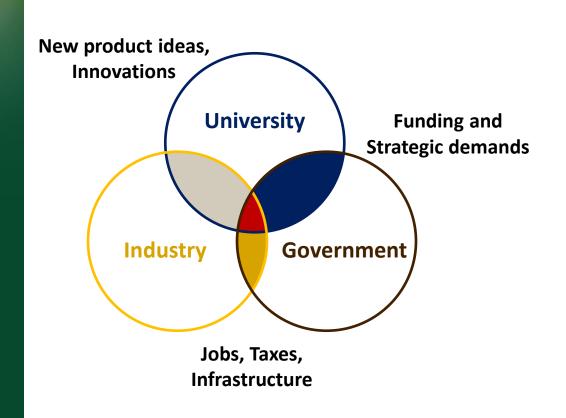








Concept of triple helix model

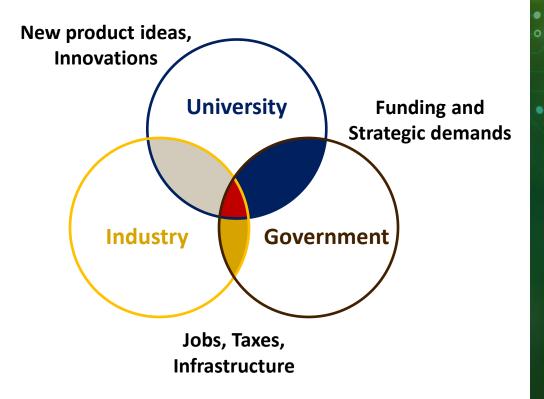


- Framework developed by Henry Etzkowitz and Loet Leydesdorff (1990s)
- Explains innovation through dynamic interaction of universities, industry, and government
- Emphasizes overlapping relationships and institutional role transformation
- Key driver of innovation in knowledge-based economies
- For example, regional innovation systems (Silicon Valley, science parks)



Principal of triple helix model

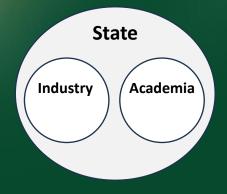
- Overlapping spheres: Create hybrid organizations (research centers, technology parks, public-private partnerships)
- Role transformation:
 - Universities become entrepreneurial,
 - Industry invests in knowledge,
 - Government fosters innovation networks



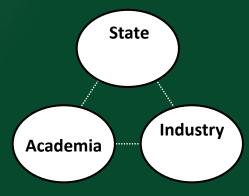


Three triple felix models

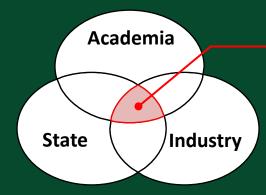
(1) A 'statist' model



(2) A 'laissez-faire' model



(3) The Triple Helix Model



Tri-lateral networks and hybrid organizations



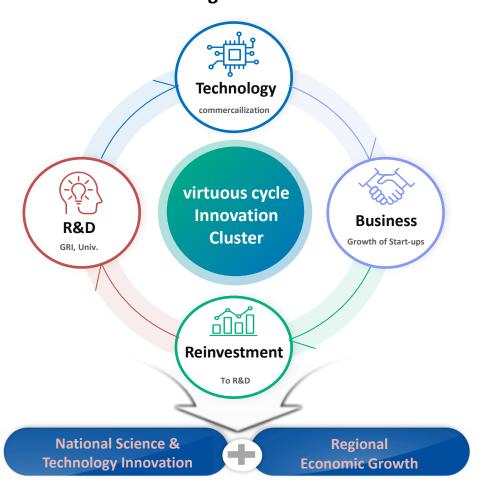
- Three configurations
 - Triple Helix I: Government-dominated (statist model) - Historical in centralized economies
 - Triple Helix II: Separate spheres with limited interaction (laissez-faire) Traditional Western industrial model
 - Triple Helix III: Balanced collaboration with strong linkages (ideal model) - Modern knowledge economy goal / Tri-lateral networks and hybrid organization
- Temporal pattern
 - Many regions evolve from I or II toward III



Overview of INNOPOLIS

Major Missions Make the innovation eco-system in INNOPOLIS

Facilitate technology commercialization to drive innovation and growth





INNOPOLIS 인천강소특구

Designation of INNOPOLIS



Designated in 2019

Category	Space	Specialized areas
Ansan	1.73km²	ICT components & materials
Gimhae	1.13km²	Biomedical · medical devices
Jinju	2.17km²	Aerospace components · materials
Changwon	0.65km²	Intelligent electronics-based machinery convergence
Pohang	2.72km	New high-tech materials
Cheongju	2.20km²	Smart IT components · systems

Designated in 2020

Category	Space	Specialized areas
Gumi	2.57km	Smart manufacturing systems
Hongneung	1.36km²	Digital healthcare
Ulju	3.01km	Futuristic cells
Naju	1.69km	Intelligent solar light · energy storage
Gunsan	2.70km	Eco-friendly EV components and materials
Cheonan · Asan	1.32km	Next-generation automobile components

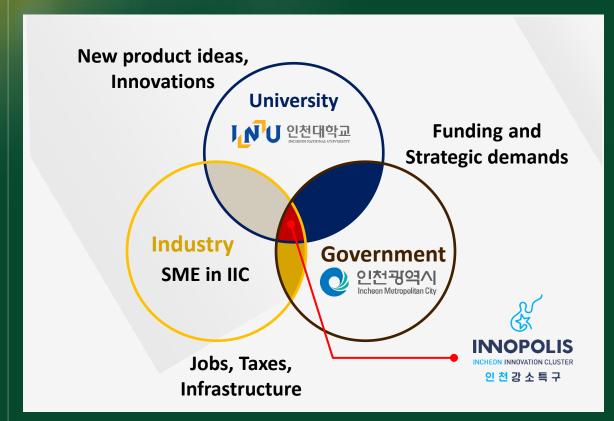
Designated in 2022

Category	Space	Specialized areas	
Incheon	1.49km²	ICT Convergence Environmental Pollution Treatment and Management	
Chun Cheon	0.93km²	New biopharmaceutical material	

- Designated in 2019
- Openignated in 2020
- Opening Designated in 2022



Incheon Innovation Cluster



- University
 - Incheon National University / Institute of Environmental Convergence Technology
- Government
 - Incheon Metropolitan City (including sub districts)
- Industry
 - Approximately 180-220's SME
 - Additional 120-150's SME for new industrial zone















Incheon National University





Domain Knowledge

- Incheon National University Startup & Venture Green Convergence Cluster, Professional Talent Training Institute (for corporate practitioners)
- Environment-Focused Specialized Graduate School - Entrepreneurship & Venture Track (for full-time graduate students)



Technology Development / Lab Validation

 Research capability, lab-level development, academic outcomes



Productization Stage

- PoC & prototype fabrication, securing R&D funds, securing patents/IP
- Startup & Venture Green Convergence Cluster (Ministry of Environment in-house program)

과하기숙제보통서부 고시 제2023-24호

이처 서구 가소여구개반투구 지전 고시 익부개기

「연구개발록구의 육성에 관한 특별법」 제4조의2 제2함에 근거하여 인 선 시구 강소연구개발목구를 변경하고 전경함에 따라, 인천 시구 강 연구개발목구 계정 고시 일부를 개정하고, [연구개발목구의 속성에 관한 독별법] 제4조 제7학 및 같은법 시행력 제조와 [로지이용구제 기본법] 제8조 및 같은한 시행령 제7조의 가장에 의하여 가능과 같이 고시합니다.

> 2023년 6월 28일 과학기술정보통신부장관

과학기술정보통신부경

인천 서구 강소연구개발특구 지정

- 1. 특구의 명칭·위치 및 면적
- 명 청 : 인천 서구 강소연구개발특구
- 위 최 : 인천 서구 오류동 및 경서동, 마추홀구 도화동, 연수구 송도동 일원
 세부점이 범위는 범성의 지형도 및 지바·지공 회원에 의항
- o 면 적 : 2.22km
- 기술핵심기관 : 0,735w, 배후공간 : 1,495a
- R&D거정지구(이원대학교): 0.73km
- 기술시합화지구(환경용복합 선약연구센터 중입환경연구단지, 환경선연단구단지): 0.717km
- 생산거정지구(검단2 일반산업단지) : 0.77km
- 특구 지정 목적
- 인천 서구의 인천대를 중심으로 ICT 음복합 환경오염 처리 및 관리 등의 R&D역량 강화 및 산・학・연 협력을 통한 기술이전 사업화 활성화



 Prototype enhancement, performance testing, design & user feedback INU Startup Center



Startup / Market Entry

- Business planning, business-model design, team building, fundraising
- INU Partners Investment Corporation



Growth & Expansion

- Company incorporation, product launch, marketing, sales & customer acquisition
- Incheon Innovation Cluster Business Association



Scale-up / Global Expansion

- Additional investment, revenue growth, expansion of staff & partnerships
- Department of International Climate Cooperation /
- KOICA Climate Degree Training Project

Specialized Fields

Measurement and
Treatment of
Environmental
Pollution
Monitoring

 Post-treatment and pre-prevention technology for possible environmental pollution by environmental agents

Major Tech.

- Advanced water purification treatment
- Ship air pollution
- Fine dust control technology

ICT-based technical base for treating and managing environmental pollution and contributing

Waste Recycling and Alternative Material Development Waste recycling and energy conversion for carbon neutrality and energy reduction & Development of eco-friendly substitute materials using biomass

Major Tech.

- Recycling of waste plastic
- Anaerobic digestion of bioplastic and food waste

AI-based Environmental Management Environmental management through prediction and decisionmaking applying environmental technology, 4th industrial revolution, digital new dill based Al and JoT



Major Tech.

- Measurement and analysis of marine environment
- Environmental information monitoring technology
- Recyclable resource recovery robots



IICE Cluster Promotion strategy i- ESP* Cluster

* Incheon/Integrated - Environment, Science, InnoPolis

Commercializing technology of

ICT convergence evironmental pollution treatment and management **Exploring demand of technology** Platforming Technology Following Development Support Commercialization and business Manufacturing **IICE Cluster Community Exploring and developing** (Lead by INU) (Industrial Complex) start-up Gumdan1 IC · Incheon Seo gu Keco Infra INU 6 Malodor prevent tech 인처뀌역시 인천대학교 North east Gyeongseo Casting • INU Incheon City start up fund National IC Complex Wastewater 0 Dust collection 9 KEITI 한국환경산업기술위 INU Incheon City start up program 입주기업 disposal tech tech. Technology Trans (INU Industry & Bus Foundation) Exploring demand of technology Commercializing Ttechnology & Business Domestic and global marketing (Environ tech Information system) **Technology** Exploring business on tech Support to Enter Domestic Verifying business valus Development & Global Market INU (Manufacturing duster INU (ECTI) **ICT** Convergence E tech Strategy to Marketing to Local 한국환경공단 marketing Government **Technology** 국립환경과학원 Institution Cluster resident Global Networking Global 국립생물자원관 business Incheon National University (INU) marketing with INU tech demand (INU Indust univ Cooperation/INU Original & Applied technology IICE Cluster (earn)

Development direction

COS Strategy

- : Core area
- : Operation area
- : Supporting area

Area 770,361 m²

District Back space

Function

Korean Industrial Convergence New
Technology Test Production base space,
technology commercialization and
production

Agency Entrepreneurship of environment technology transfer company Start up space/startup company

Technology institution

R&D base district

Core

Area 731,868m²

District Technology core institution

R&D, technology commercialization, human resource training, technology startup, corporate growth support institution

Agency Incheon National University

Industrial Facility Area

Production base district

Operation

Commercialization
Promotion
Organization

Technology commercialization district

Supporting

Area 717,892m²

District Back space

Function

Technology commercialization, technology development, human resource training, trial certification, corporate support

Agency
NIER, National Institute of Biological
Resources, NIEHRD,
KEITI, KECO

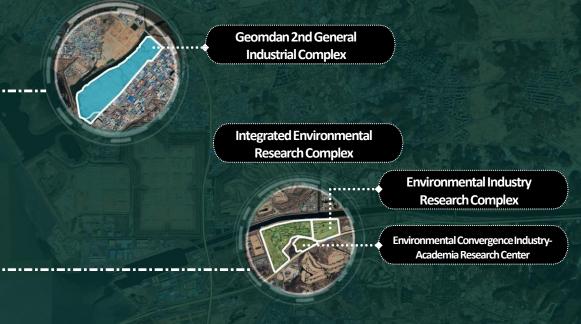
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+ Establishing an ICT-Convergence Hub for Environmental Pollution Treatment & Management + Technology Commercialization









INU Jemulpo Campus



Specialized in the Environmental Industry



The only participation of central government departments



Participation in Incheon National University, a leading start-up in Korea



Korea's Largest
Environmental Industry
Infrastructure Area

Innopolis Innovation Cluster PR video





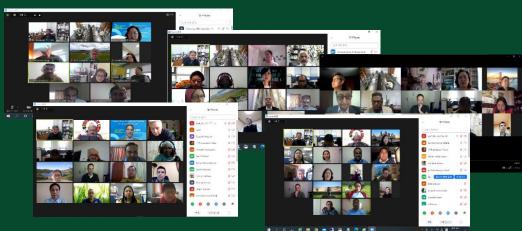


IIC Confex & I.NERGY Symposium



























Korea-Central Asia Science & Technology Center



Final Goal



Three Strategic Objectives



Detailed Implementation Objectives "Promote Mid-to Long-Term international Cooperation on S&T Development

Establish a sustainable cooperation system linking technology, human resources, and industry via the K-CAST Center

◆ Establish a Sustainable Korea-Central Asia Future Platform through an S&T-Based Dev. Cooperation Model ◆

Networking

Talent Exchange

Tech Coop.

Foundation & Outreach

Cooperation & Execution

Expansion & Sustainability

Initial Structure Formation: talent discovery, conferences, platform building

1. Establish and Build an Operational Base for the Center (Including Platform)

- Establish branch/cooperation centers in 6 partner countries
- Hold regular ops committee meetings (6)
- Build tech business platform

2. Host annual international conference

- Operate Central Asia special sessions (3)
- Invite 10 outstanding Central Asian researchers

3. Support talent exchange and recruitment activities

- Hold promotion sessions in major cities of partner countries (3)
- Select 10 trainees for KOICA degree programs

Implementation of cooperation projects: joint research, ODA linkage, tech trend analysis

4. Tech Trends & Domestic Expansion

- Conduct tech trend surveys & publish result-sharing reports (3)
- R&BD surveys at INU & IIC



5. Strengthen Networks for Joint Research & Tech Cooperation

- On/offline joint workshops & forums (4)
- MOUs with research institutes & universities in each country (15)

6. Joint ODA Project Identification & Linkage

- Plan joint research projects (6)
- Identify & propose ODA-linked projects (3)

Settlement Stage:

Demo Cooperation, Platform Use, Sustainability

7. Develop Sustainable Operation Strategies & Foundation

- Implement demonstration projects through tech cooperation (3)
- **8.** Match Korean Tech Companies with Central Asia Tech Needs & Demonstration Cooperation
- Match excellent technologies based on local demand (3)

9. Utilize Tech Business Platform & Support Local Expansion

- Secure partners and participants; sign 20 MOUs





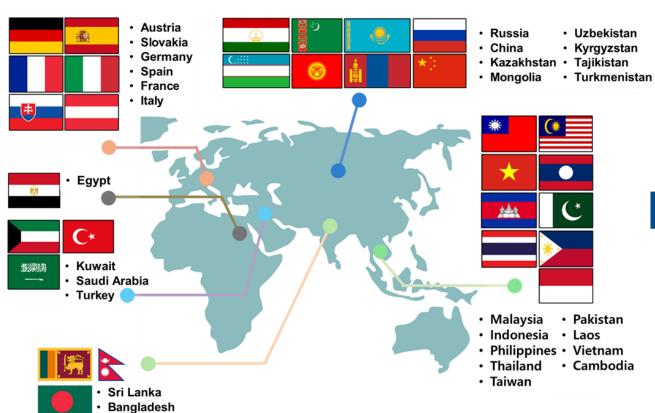
Korea-Central Asia Science & Technology Center

The project's principal investigator, Prof. Heekwan Lee, established I.NERGY in 2011, building a coop. network spanning 30 countries worldwide

Sustain active academic & tech exchanges on environment, energy, climate with I.NERGY and International organizations (KOICA, GCF, CTCN,

UNDP, UNIDO).

Nepal



Incheon National University Compate Change Specialized Department of Cimate International Cooperation Establishing a network of INERGY member countries Holding an arrual symposium involving overseas institution International Organizations GCF&15 other international organizations in Incheon Cooperation with the Cimate Technology Center Network (CTCN) Office UNDO, Incheon City, and Incheon Netional University are



negotiating a multilateral MOU



Incheon Metropolitan City

· Plan for Designation of Environmental R&D Special Zone

Incheon International Development

Cooperation Center

Incheon National University & Incheon City & KOICA Joint Center

 Support international development projects and overseas expansion through a platform for development assistance in

· Incheon Green Ofmate Oluster Master Plan

Supporting and promoting green climate industries















INU-KOICA Degree Program



Training Convergence Climate Environment Infrastructure Experts Focused on Partner Countries

Technology & Industry

 Strengthen capabilities to understand climateenvironment technologies and develop strategies based on scientific evidence

Build reapacity to formulate and implement climateenvironment policies that reflect the specific contexts of partner countries



Climate Finance & Enterprise

► Enhance professional capacity for global climate-finance mechanisms to address climate change

Climate Environment Policy

Domestic Cooperation

Incheon Innovation Cluster

- · Activation of industrial technologies
- · Overseas technology transfer

Incheon International Development Cooperation Center

 Strengthened collaboration with KOICA

Songdo Global Campus

 Strengthen research-exchange cooperation with universities such as Ghent and George Mason

Foundational Courses

Understanding climate environment

Climate big-data statistics

Al-based climate / environment modeling

Environmental economics

Advanced/Professional Courses

Industrial infrastructure inventory

Training on PCP preparation (Project Concept Paper)

Understanding climate finance

International Cooperation

GCF (Green Climate Fund)

- Enhance educational capacity (invite adjunct faculty)
- Build a project-discovery network among INU–KOICA–GCF

CTCN (Climate Technology Centre & Network)

- Technology transfer via PCPs and filing international patents
- Discover new research focused on technology upscaling (TA projects)

Dissemination of K-Climate & Environment Industrial Technologies

Improvement of Climate— Environment Governance Systems

Linkage with Climate Finance

INU-KOICA Degree Program



Operation of Capacity Building Professional Track

Master's Training Program for Climate-Environment Capacity Building **Existing Courses** Planned Courses Climate Climate-resilient urban infrastructure **Environment** · Climate-change assessment & modeling Core policy Climate-environment information analysis · Climate-environment economics C&E C&E Climate Technology Policy Finance **Existing Courses Existing Courses Existing Courses** · GHGs emission · Climate change Green finance & Climate inventory law / policy sustainable investment Change Mitigation Planned Courses Planned Courses Planned Courses Sustainable carbon Al-based early response Evaluation and responses capture & storage in climate finance to climate risks **Existing Courses Existing Courses Existing Courses** Climate change adaptation Climate policy Planned Courses Planned Courses Change Planned Courses Carbon finance market Adaptation Low-carbon environment & health impacts Climate-change · Climate change adaptation Sustainable water resources/ vulnerability assessment investment strategies infrastructure management Al Basics (Non-credit program: Al fundamentals & understanding) ΑI Planned Courses Basics

Foundations of deep

learning

Al-based image

analysis

· Foundations of machine

learning

Modular Curriculum

 Learner-centered, capacity-building modular program, combining the pillars

(Climate-Environment Technology + Climate-Environment Policy + Climate Finance)with focus areas Climate-change Mitigation and Climate-change Adaptation

🏏 Thesis Supervision & Degree Conferment

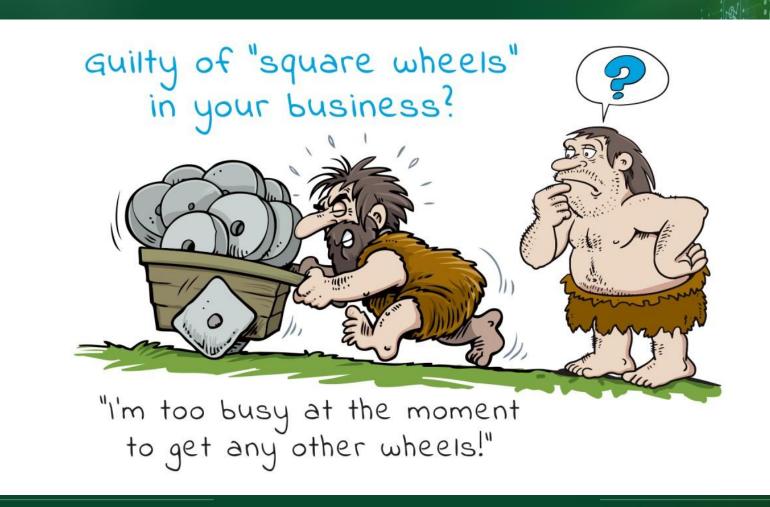
- One-to-one thesis advising with ad-hoc meetings with the advisor
- Thesis topics selected to align with each participant's country needs in climate change and the environment
- Build research networks that connect advisors and their home institutions
- Degree awarded according to thesis-committee composition and academic regulations.



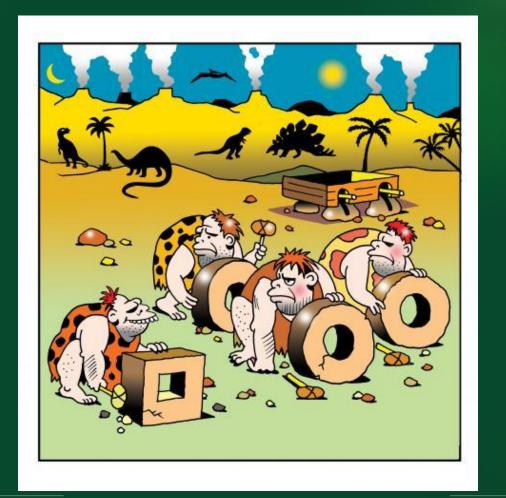




Need to innovate ??



Need a teamwork ??







IIC Collaboration







Korea ICT convergence environmental technology based Incheon Environment Innovation Cluster will lead ...



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