



**WELCOME TO THE 14<sup>th</sup> CONFERENCE ON SUSTAINABLE DEVELOPMENT  
OF ENERGY, WATER AND ENVIRONMENT SYSTEMS**



REPUBLIC OF CROATIA

MINISTRY OF ENVIRONMENT  
AND ENERGY



Ministry of Science and Education

## GOLD



Prince Sultan Bin Abdulaziz  
International Prize for Water

## SILVER

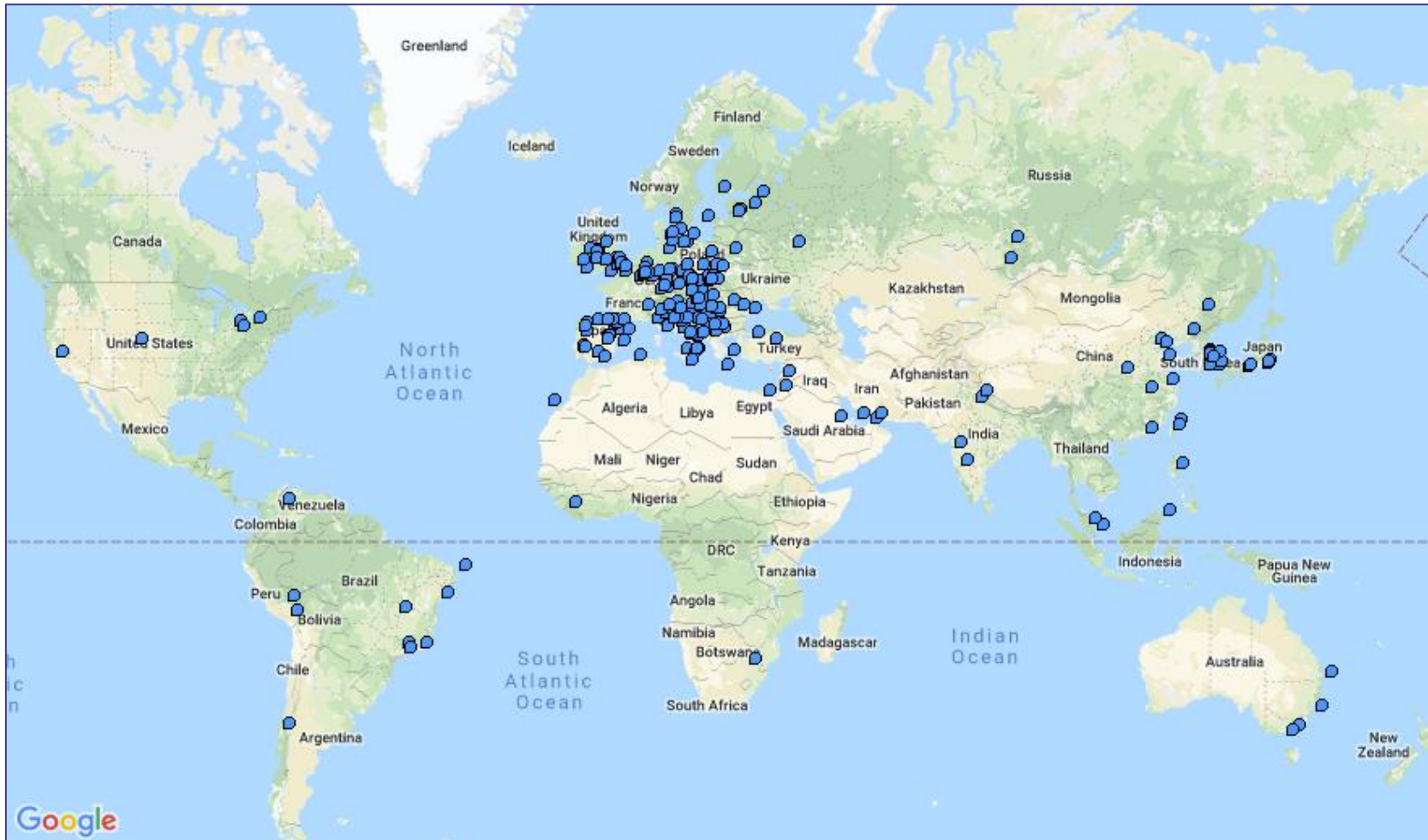


## BASIC





## OUR PARTICIPANTS



Around **610** participants coming from **55** countries, **280** cities and around **350** universities, institutes and companies





# OUR PARTICIPANTS



# SDEWES Conference series



## 1<sup>st</sup> - 13<sup>th</sup> Conference on Sustainable Development of Energy, Water and Environment Systems

2002, 2003, 2005, 2007, 2009, 2011,  
2012, 2013, 2014, 2015, 2016, 2017, 2018 ...  
SEE 2014, 2016, 2018 ...

AP 2018

University of Zagreb + Instituto Superior Técnico



	2002	2003	2005	2007	2009	2011	2012	2013	2014	2015	2016	2017	2018
<b>COUNTRIES</b>	35	42	46	34	55	52	42	62	56	64	58	61	61*
<b>ATTENDED</b>	140	83	134	132	329	418	211	559	320	534	490	563	737*
<b>PRESENTED</b>	98	96	158	230	349	398	231	601	326	532	535	602	736*
<b>SUBMISSIONS</b>	197	162	252	281	709	1029	607	1120	869	1204	1033	1036	1277*
<b>Sub/attended</b>	1.4	2.0	1.9	2.1	2.2	2.5	2.9	2.0	2.7	2.3	2,1	1.84	1.73*

\* Combined three conferences held in 2018

# Published – 1535 papers

- Partner journals that publish papers from SDEWES (800 papers published up to now in Special issues:
- Applied Energy
- Renewable & Sustainable Energy Reviews
- Journal of Cleaner Production
- Energy Conversion and Management
- Energy
- Journal of Environmental Management
- International Journal of Hydrogen Energy
- Clean Technologies and Env. Policy
- Waste Management & Research
- Thermal Science
- Management of Environmental Quality
- IJSWES, IJARGE, IJESD, IJISD, PIE, Utilities Policy, WMR
- JSDEWES, IJSEPM, EES
- <http://www.sdewes.org/journals.php>

### PUBLISHING POLICY

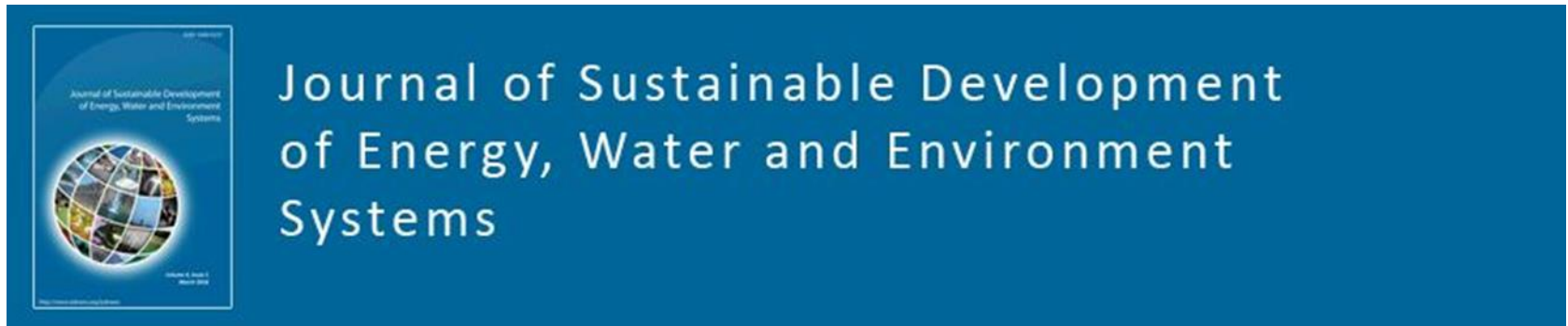
SDEWES Conference may decide to publish a special issue with one or more of the partner journals. Only submissions that were presented at the Conference by one of the authors may be invited to a special issue.

Manuscripts have to be submitted to the special issue of the journal according to instructions provided in the invitation letter. Each manuscript will then be reviewed according to the journal policy.

The authors are obliged to inform the conference of the status of their submission in a way provided in the invitation letter.







- Editor-In-Chief: Neven Duić
- Online, open access, from 2013  
<http://www.sdewes.org/jsdewes/>
- Publisher: SDEWES Centre
- Indexed: SCOPUS, INSPEC, Hrcak, DOAJ, Google Scholar, Croatian Web Archive, National and University Library in Zagreb
- CiteScore 1.41 (Scopus)
- Web of Science Core Collection - Emerging Sources Citation index since 2016



- Use **#SDEWES** on Twitter and Facebook
- Tag yourself on [@sdewes\\_centre](https://www.instagram.com/sdewes_centre) pictures from the conference
- Papers must be presented by the presenting author
- AWARD session, Group Photo session, Poster session, Invited lecture ...



# “Smart Islands”

Asst. prof. Goran Krajačić, dipl. ing.

SDEWES 2019

**DUBROVNIK**

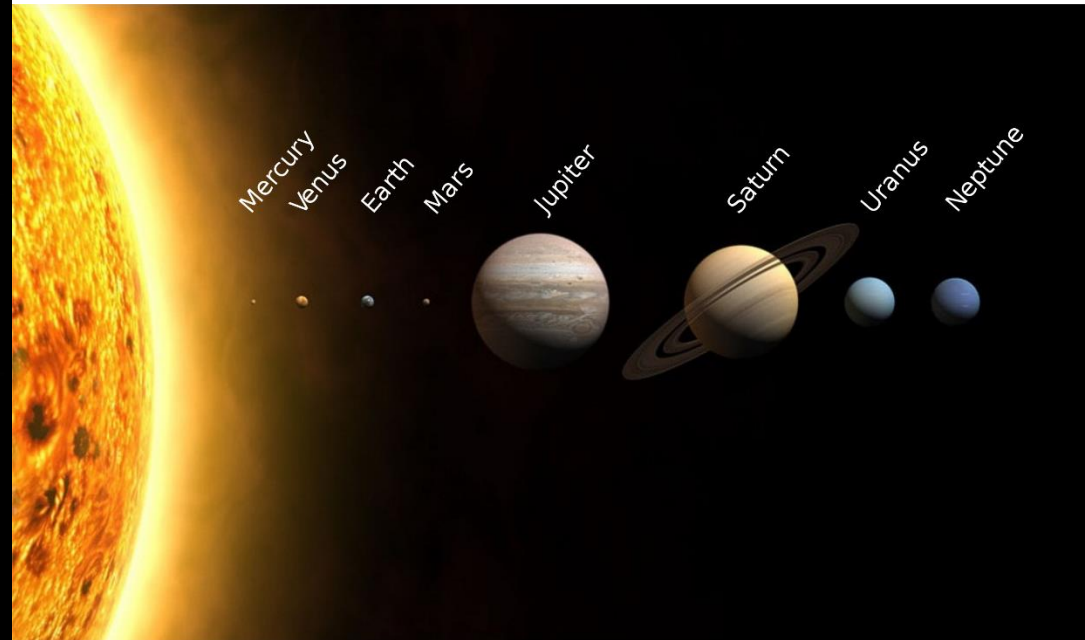
02/10/2019



- everyone and everything can be an „island”?



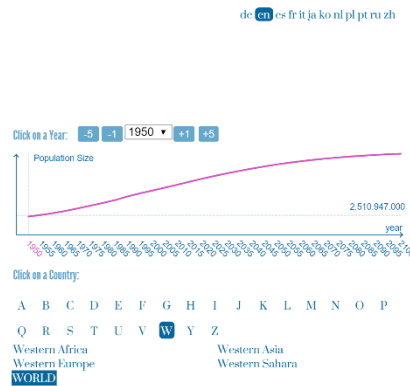
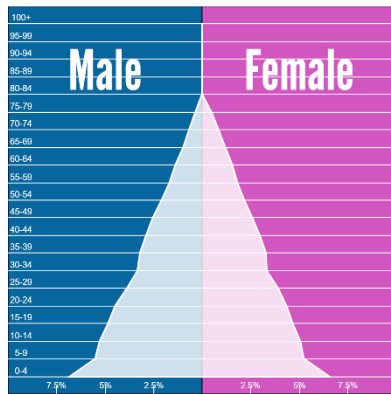




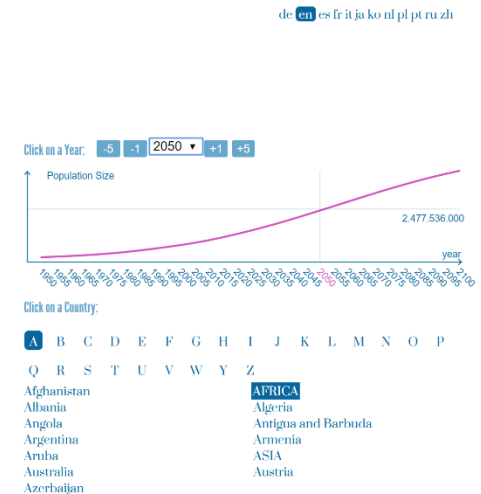
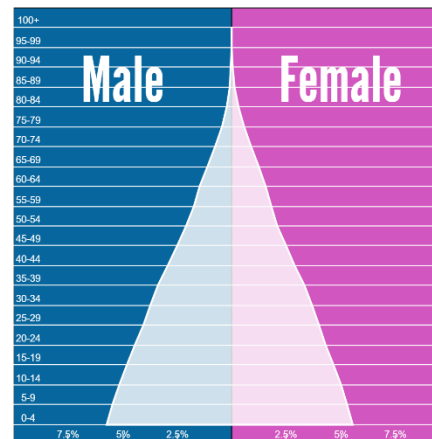


# DEMOGRAPHY: WORLD-AFRICA

**WORLD**  
**1950**  
Population: **2.510.947.000**



**AFRICA**  
**2050**  
Population: **2.477.536.000**

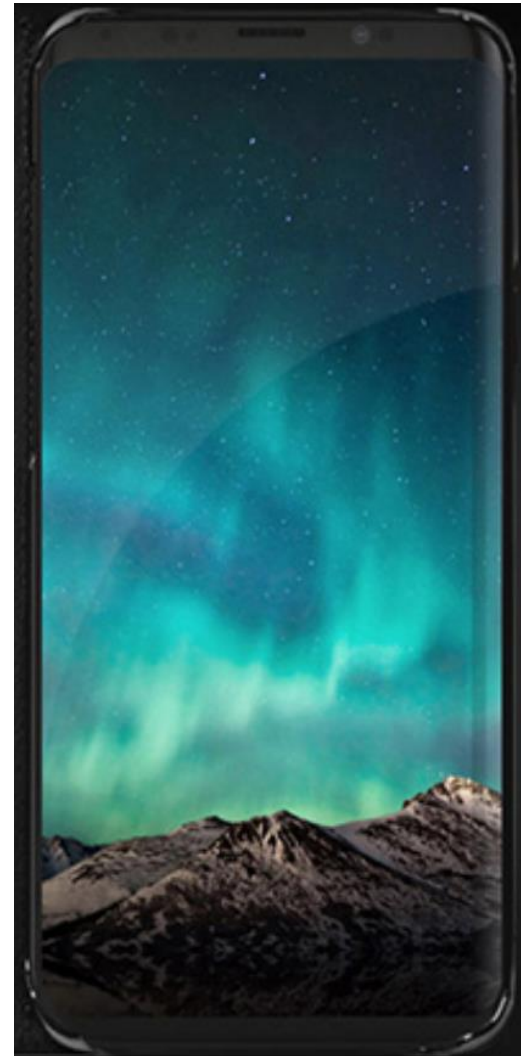
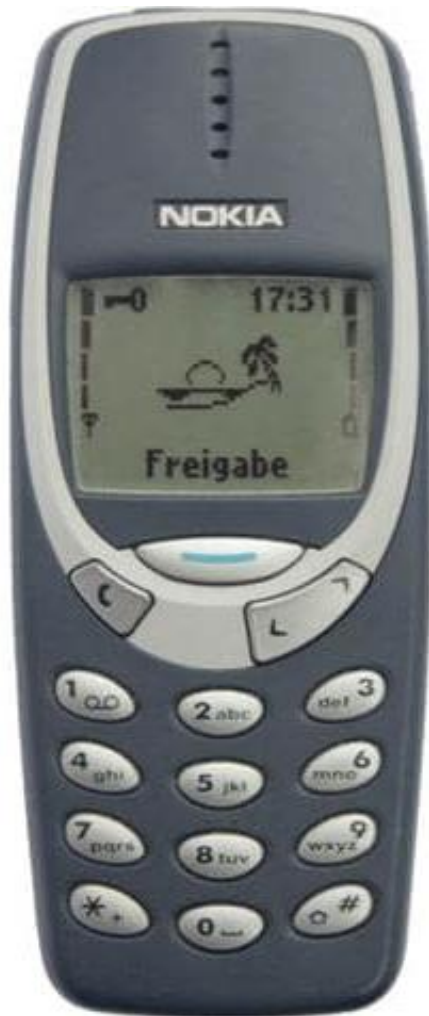




Smart phone  
Smart TV  
Smart Building?  
Smart car?  
Smart grid?  
Smart thermal grid?  
Smart gas grid?  
Smart transport?  
Smart energy system?  
Smart city?  
Smart politicians?  
Smart government?  
Smart people?

**Smart islands?**









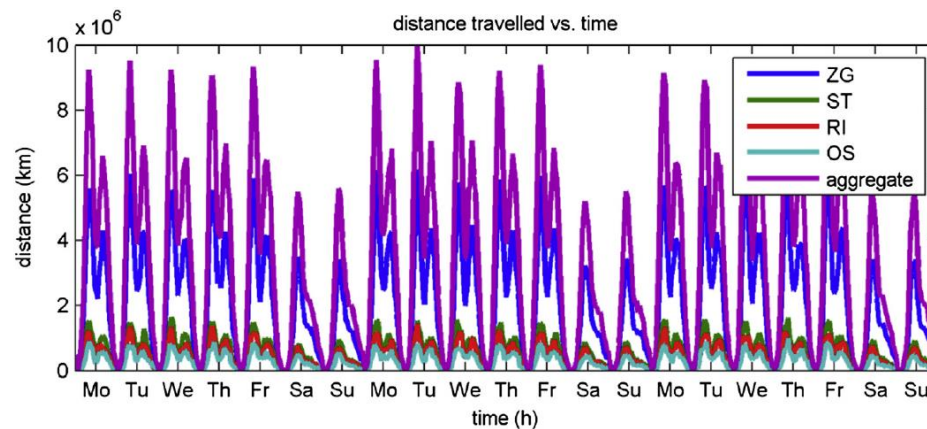
# Smart energy systems

*“We have to move away from a sole focus on areas like the electricity sector and look at the energy demands of the heating, cooling and transport sectors as well. We have to better connect the different sources and consumption areas – in a smart energy system.”*

*Prof. Brian Vad Mathiesen, Aalborg  
University, Denmark*



# Transport system variability



Renewable and Sustainable Energy Reviews

Volume 99, January 2019, Pages 109-124



## Integration of transport and energy sectors in island communities with 100% intermittent renewable energy sources

Hrvoje Dorotić , Borna Doračić, Viktorija Dobravec, Tomislav Pukšec, Goran Krajačić, Neven Duić

 Show more

<https://doi.org/10.1016/j.rser.2018.09.033>

Get rights and content



Agent based modelling and energy planning – Utilization of MATSim for transport energy demand modelling

T. Novosel <sup>a,\*</sup>, L. Perković <sup>a</sup>, M. Ban <sup>a</sup>, H. Keko <sup>b</sup>, T. Pukšec <sup>a</sup>, G. Krajačić <sup>a</sup>, N. Duić <sup>a</sup>

<sup>a</sup> University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture, Department of Energy, Power Engineering and Environment, Bina Duića 5, 10002 Zagreb, Croatia

<sup>b</sup> Energy Institute Hrvatske Ploče, Department for Energy Generation and Transformation, Savska 103, 10001 Zagreb, Croatia

# RenewIslands/ADEG METHODOLOGY

1. Mapping the **needs**
2. Mapping the **resources**
3. Devising **scenaria** with technologies that can use available resources to cover needs
4. **Modelling** the scenaria

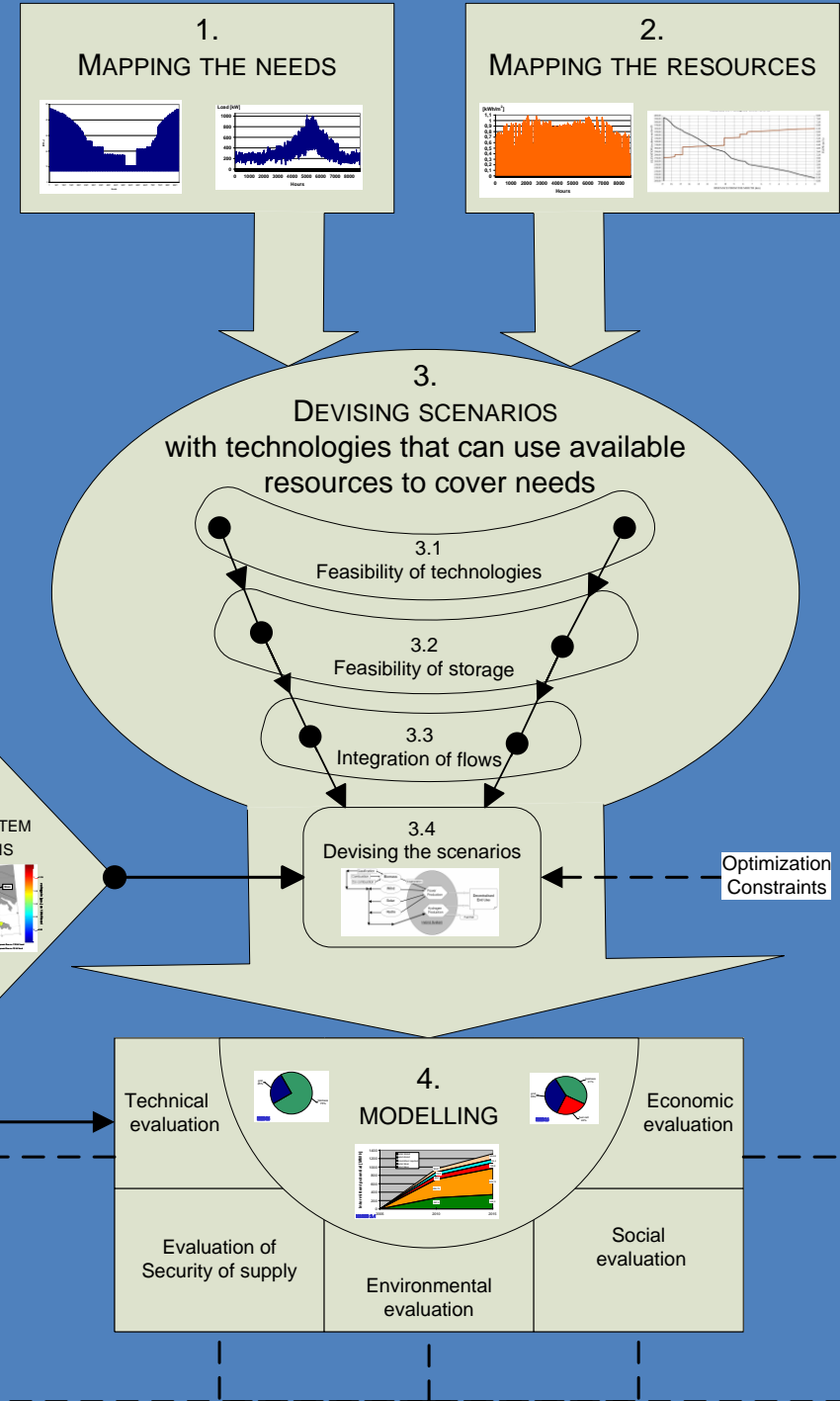


Renewable and Sustainable Energy Reviews  
Volume 12, Issue 4, May 2008, Pages 1032-1062



RenewIslands methodology for sustainable energy and resource planning for islands

Neven Duić<sup>a</sup>, Goran Krajačić<sup>a</sup>, Maria da Graça Carvalho<sup>b,1</sup>





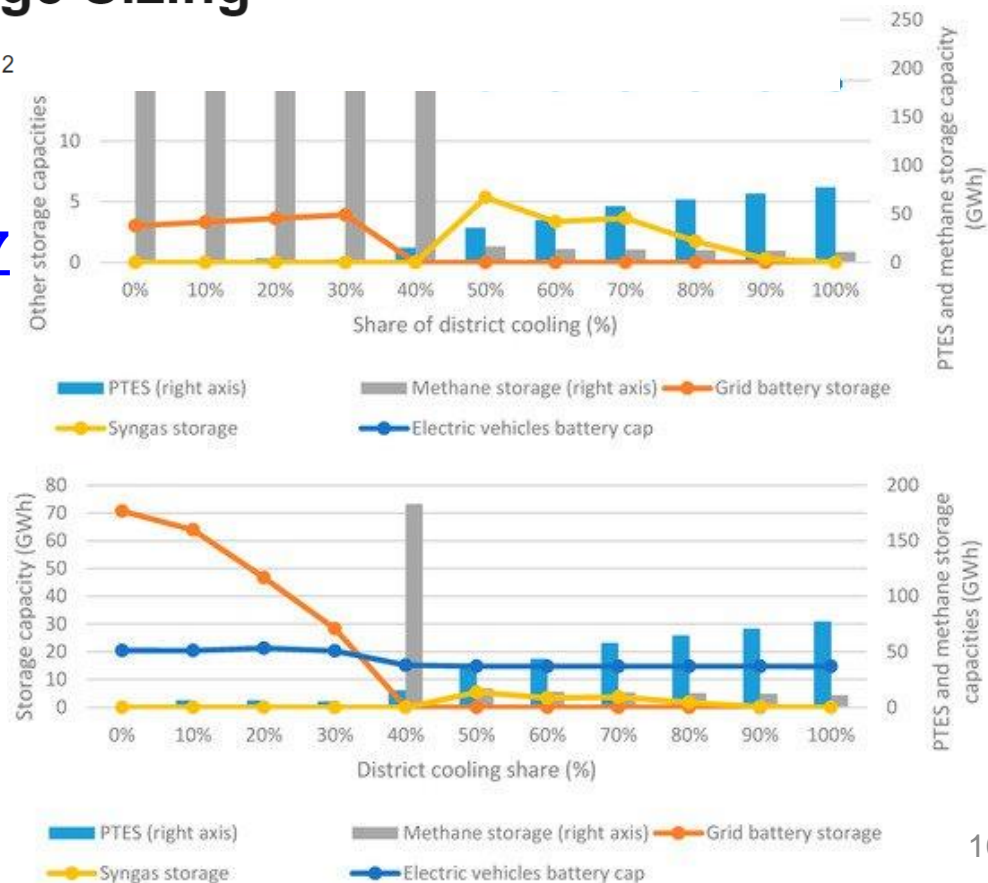
Open Access

Article

# District Cooling Versus Individual Cooling in Urban Energy Systems: The Impact of District Energy Share in Cities on the Optimal Storage Sizing

by Dominik Franjo Dominković<sup>1,\*</sup>  and Goran Krajačić<sup>2</sup>

*Energies* **2019**, *12*(3), 407;  
<https://doi.org/10.3390/en12030407>







Applied Energy

Volume 251, 1 October 2019, 113290



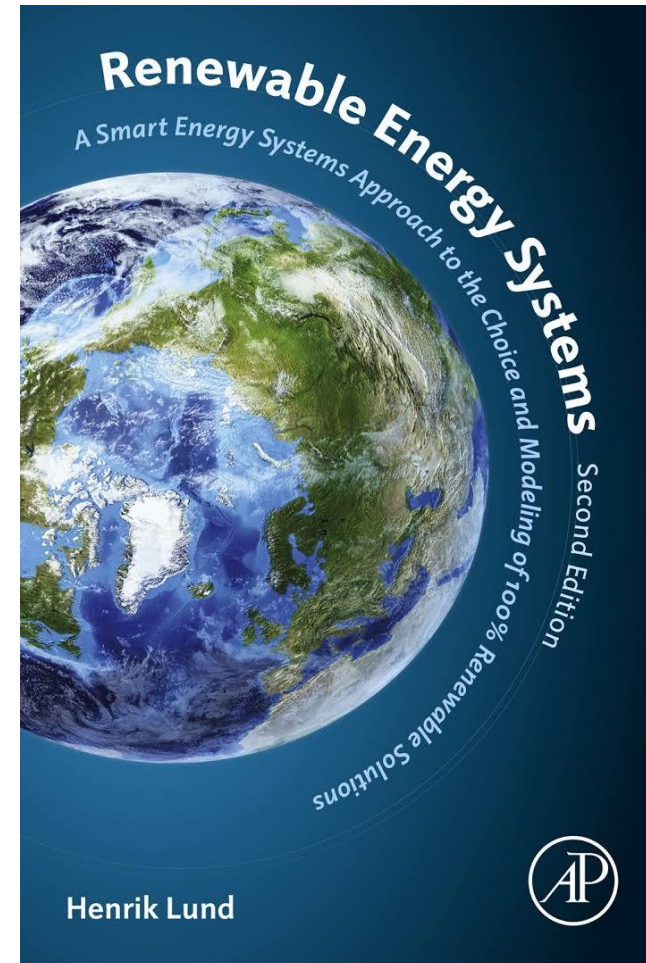
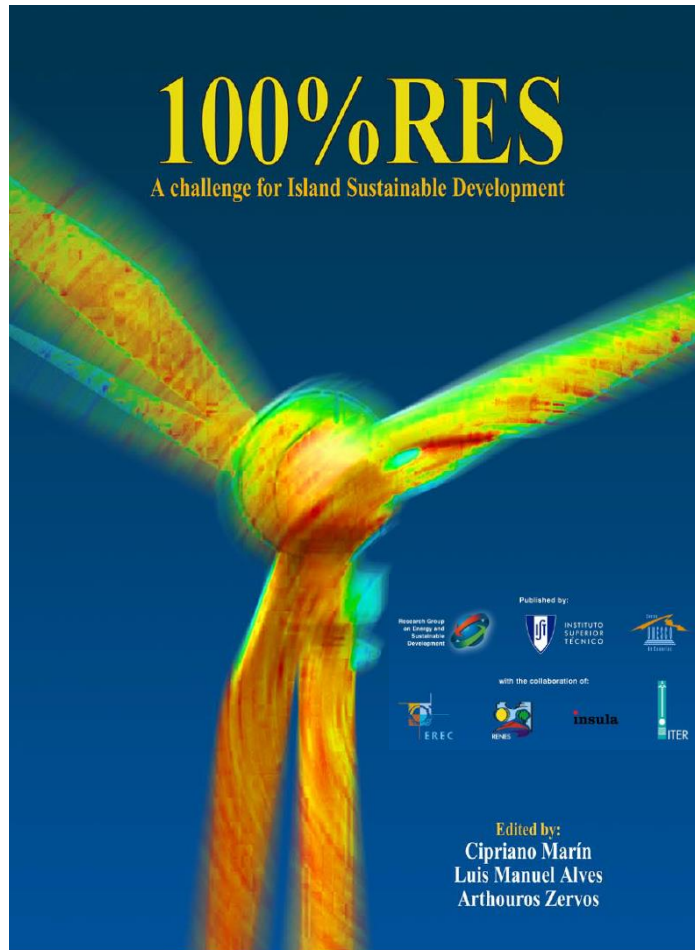
# On the transferability of smart energy systems on off-grid islands using cluster analysis – A case study for the Philippine archipelago

Henning Meschede <sup>a</sup> <sup>1</sup> , Eugene A. Esparcia Jr. <sup>b, 1</sup>, Peter Holzapfel <sup>c</sup>, Paul Bertheau <sup>d</sup>, Rosario C. Ang <sup>e</sup>, Ariel C. Blanco <sup>e</sup>, Joey D. Ocon <sup>b</sup> 

 [Show more](#)

<https://doi.org/10.1016/j.apenergy.2019.05.093>

[Get rights and content](#)





## Technology readiness levels (TRL)

Where a topic description refers to a TRL, the following definitions apply, unless otherwise specified:

- TRL 1 – basic principles observed
- TRL 2 – technology concept formulated
- TRL 3 – experimental proof of concept
- TRL 4 – technology validated in lab
- TRL 5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 7 – system prototype demonstration in operational environment
- TRL 8 – system complete and qualified
- TRL 9 – actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

Extract from Part 19 - Commission Decision C(2014)4995



# Republic of Korea $\neq$ Republic of Croatia?



## SMART ENERGY CREATOR KEPCO

### 6 KEPCO's New Vision for Opening the New World for Hope 9

In the new era of the electricity business, KEPCO is on the verge of leaping forward once again as the "Smart Energy Creator". Beyond our proud history of 116 years, KEPCO will establish a new vision as an innovative value creator for the global energy industry and grow into a globally-renowned energy company to contribute to people and society and write a new chapter in history.

### Smart Energy Creator, KEPCO

Creating new future values with creative and harmonious energy and opening the world of clean and convenient energy



Smart Energy



Creator

"Smart Energy" refers to energy enhancing the efficiency in production and consumption and creating new values by combining eco-friendly and ICT technology in the processes of producing, transporting and consuming electricity. With Smart Energy, KEPCO will not only provide customers with convenient and effective energy and make a better environment for society, but also provide new business opportunities by cooperating with companies to create new profits and jobs.

The convergence of technology and values is approaching as a massive new trend for the future. Beyond the basis of development of the national economy, the electricity business will be a core infrastructure for creating converged values with new technology. With new services and energy platforms, KEPCO will grow from an existing provider of electricity into a company enhancing the quality of life for customers and the first mover to lead the future of energy.



Sjaj u tami.

**HEP**  
Više od struje





# Smart Islands Initiative

[www.smartislandsinitiative.eu](http://www.smartislandsinitiative.eu)

- Take action to mitigate and adapt to climate change and build resilience at local level
- Trigger the uptake of smart technologies to ensure the optimal management and use of our resources and infrastructures
- Move away from fossil fuels by tapping our significant renewables and energy efficiency potential
- Introduce sustainable island mobility including electric mobility
- Reduce water scarcity by applying non-conventional and smart water resources management
- Become zero-waste territories by moving to a circular economy
- Preserve our distinctive natural and cultural capital
- Diversify our economies by exploiting the intrinsic characteristics of our islands to create new and innovative jobs locally
- Strengthen social inclusion, education and citizens' empowerment
- Encourage the shift towards alternative, yearlong, sustainable and responsible tourism





[www.smartislandsinitiative.eu](http://www.smartislandsinitiative.eu)



### ENERGY

- smart technologies • renewables • energy efficiency • prosumers • heating & cooling • test-beds • demand-response • flexibility • pilot projects • storage



### TRANSPORT

- sustainable mobility • EVs • electric ships • cold ironing • LNG vessels • island hopping • car sharing • cycling • smart ports and airports



### WATER

- grey water recycling • rain water harvesting • desalination • responsible consumption • ICZM • Ecosystem-based adaptation



### WASTE

- zero-waste territories • circular economy • sustainable production & consumption • water energy food nexus



### GOVERNANCE

- sustainable, long-term infrastructure planning • multi-stakeholder collaboration • financial & technical assistance • citizen empowerment • local ownership



### ICT

- integrated infrastructure management • start-ups • improved digital services • innovation • participatory decision-making



### ECONOMY

- economic diversification • cooperatives • crowd-funding • aggregation • economies of scale • strategic partnerships • entrepreneurship



The formal signing of the Smart Islands Declaration in the EU Parliament on March 28, 2017



**REGIONALNA  
ENERGETSKA  
AGENCIJA KVARNER**



# 'Clean Energy for EU Islands' launched in Malta

PAGE CONTENTS



MALTA EU2017



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ABOUT

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NEWS & EVENTS

SAVE THE DATE!

**4th Clean Energy for  
EU Islands Forum**

Split/Hvar 20-22 Nov.

LANZAROTE  
PHOTO JOSEP CASTELLS





- Smart Island Krk







[tomislav.uroda@icat.hr](mailto:tomislav.uroda@icat.hr)

M +385 91 1240023

F +385 1 5506473



Bornholm Island



Madeira  
Island



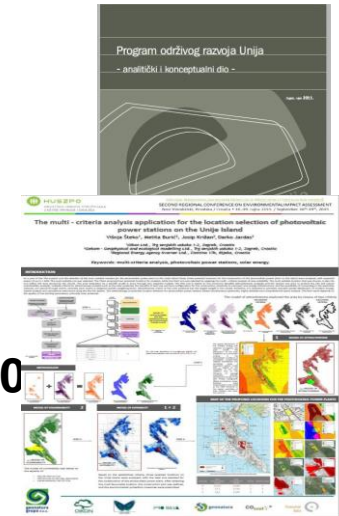
Unije Island

## Decarbonising energy systems of geographical Islands

Horizon 2020

Call: H2020-LC-SC3-2018-2019-2020

(BUILDING A LOW-CARBON,  
CLIMATE RESILIENT FUTURE:  
SECURE, CLEAN AND EFFICIENT  
ENERGY)



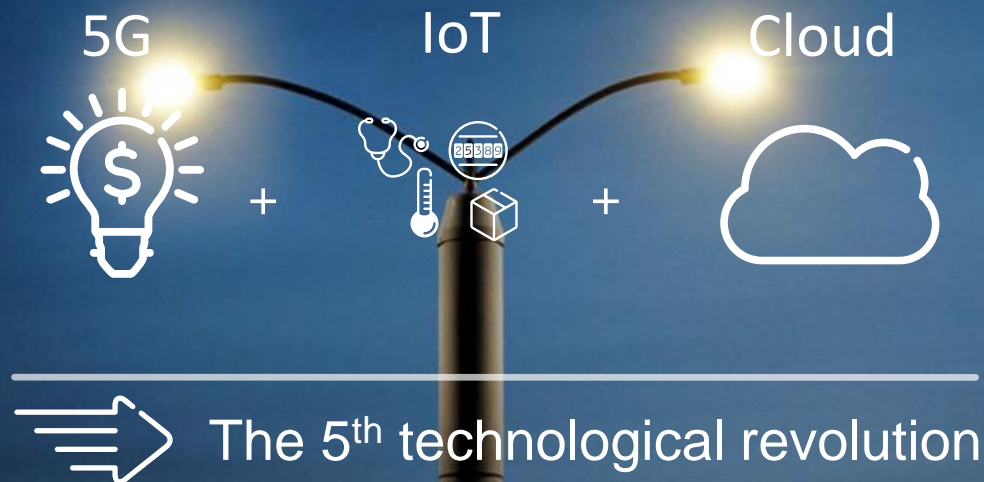
Maximizing the impact of innovative  
energy approaches in the EU islands





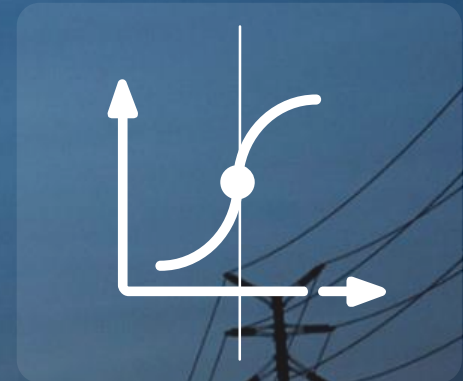


# At an inflection point



INSTALLATION

TRANSFORMATION





# THANK YOU FOR YOUR ATTENTION!

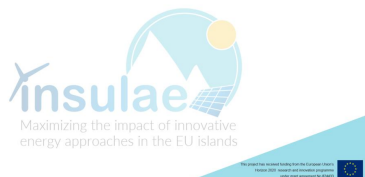
[goran.krajacic@fsb.hr](mailto:goran.krajacic@fsb.hr)

## Other projects

<http://het.hr/>



Beyond Energy Action Strategies



Phoenix Project (H2020-  
MSCA-RISE-2015)



## Scientists using YouTube and other social media to foster sustainable development

15.10.2019

Seite: 1

Prof. Dr. habil. Ingo Stadler  
Cologne Institute for Renewable Energy

Technology  
Arts Sciences  
TH Köln











15.10.2019

Prof. Dr. habil. Ingo Stadler  
Cologne Institute for Renewable Energy

Seite: 4

Technology  
Arts Sciences  
TH Köln

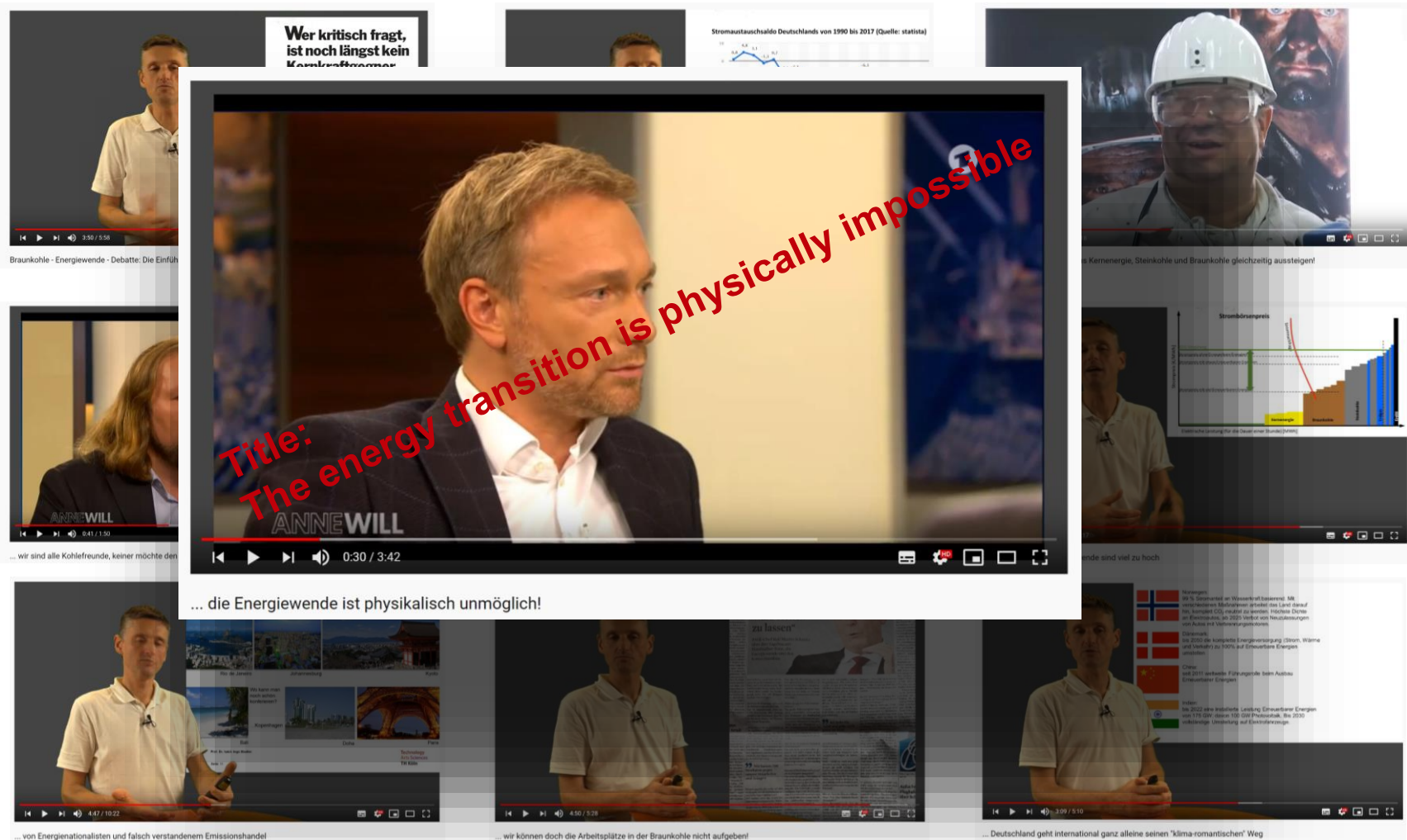


# Discussion Forums ...

The screenshot shows the Facebook interface for the group 'Energiewirtschaft Deutschland'. The cover photo features a collage of renewable energy sources: wind turbines on a hill, solar panels, and a large industrial power plant with smokestacks. The left sidebar contains navigation links: Info, Diskussion (highlighted), Chats, Ankündigungen, Mitglieder, Veranstaltungen, Videos, Fotos, and Dateien. Below these are search and favorite group options. The main content area shows a post from the 'Energie & Management Verlagsgesellschaft' (E&M) administrator, dated February 21st at 09:07. The post text reads: 'Liebe Gruppenmitglieder, in der Gruppe kommt es immer wieder – (leider immer häufiger) zu aggressiven und diskriminierenden Äußerungen.' The right sidebar displays the group's name, member count (1,242), and a list of suggested members.

# Ten lies about lignite

## People like negativity, sensations

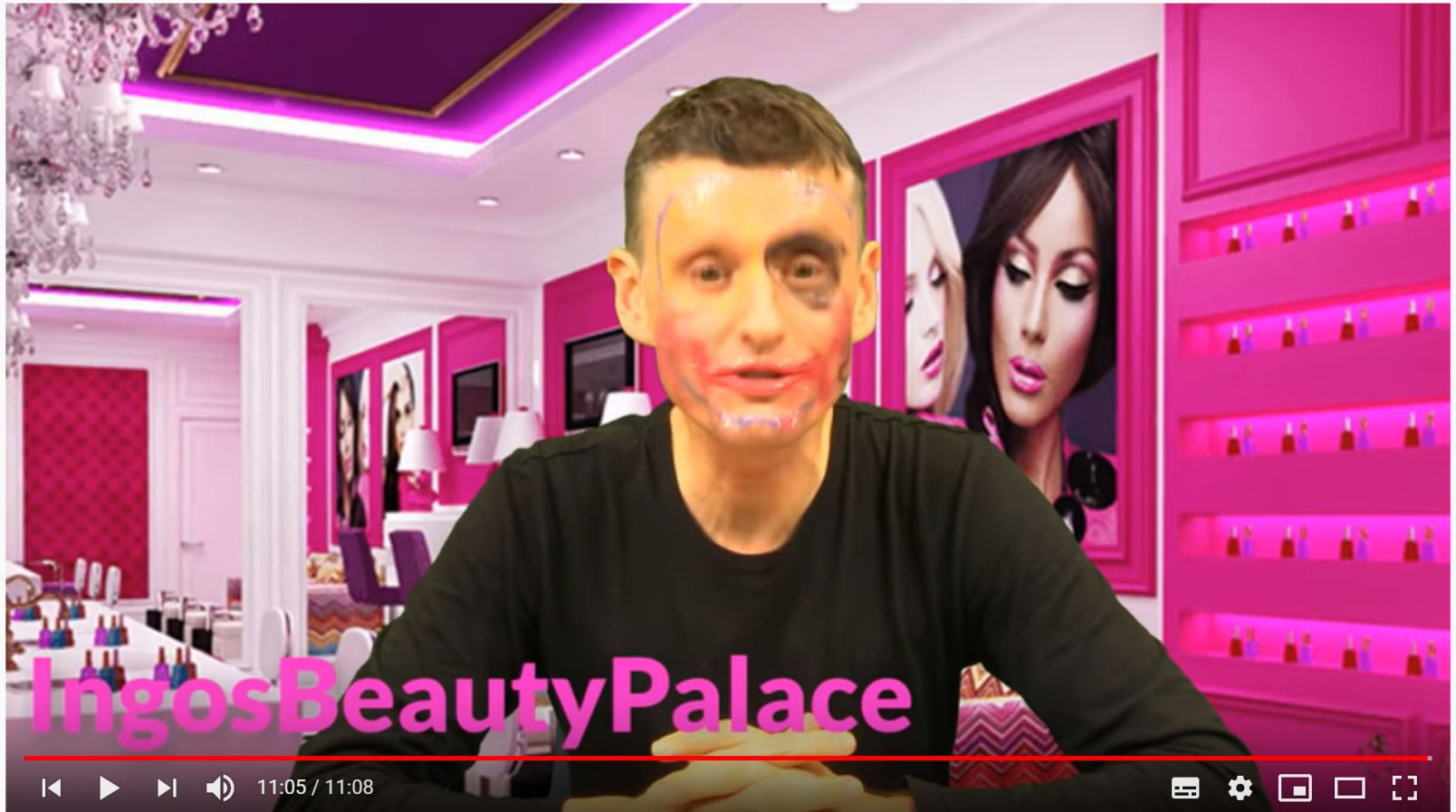






YouTube<sup>DE</sup>

Suchen



IngosBeautyPalace

15.10.2019

Seite: 7

**Prof. Dr. habil. Ingo Stadler**  
Cologne Institute for Renewable Energy

**Technology**  
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# Flipped Classroom

15.10.2019

Seite: 8

**Prof. Dr. habil. Ingo Stadler**  
Cologne Institute for Renewable Energy

**Technology**  
**Arts Sciences**  
**TH Köln**





# Motivation

Problems with the classical teaching format - lecture / exercise / lab:

Little chances for

- ✓ individual learning speed
  - ✓ individual learning style and
  - ✓ intensive advice
- of the students.

- ✓ Absent professors



Need to use new  
types of teaching  
and examinations  
for student-centered  
and competence-  
based learning

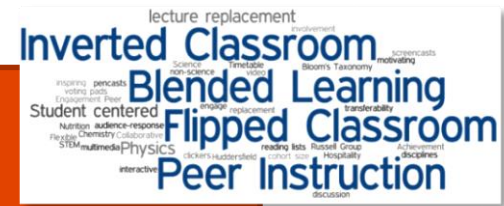
Source: TH Köln, Martin Bonnet



# flipped classroom

## „flipped classroom“

Learning content is studied by students at home; the application happens at the university.



## Expectations

- ✓ There is more time available for learners to be coached by the teachers.
- ✓ Students will be able to learn the content independently and at their own pace.

Source: TH Köln, Martin Bonnet

# Motivation

## Implementation

- ✓ Online instructional videos
- ✓ Labs with small groups
- ✓ Mini-tests before each presence event
- ✓ Final exam



## Expectation

- ✓ In the presence phase, questions that have arisen during preparation can be clarified together and the knowledge deepened and applied.
- ✓ The teacher becomes the moderator.

Source: TH Köln, Martin Bonnet

# Implementation in ILIAS

General

Teaching Units

General

Further documents and links

Source: TH Köln, Martin Bonnet

# Implementation in ILIAS – Online Forum

**ILIAS** E-Learning der Fachhochschule Köln

Persönlicher Schreibtisch | Magazin

Magazin » Fakultät 09 » Kurse der Lehrveranstaltungen » Bachelorstudiengänge » Maschinenbau (MAS) » 1.-3. Semester » Bonnet - Werkstofftechnik WS 2012-2013 » Lehr- Lerneinheit 1

## Lehr- Lerneinheit 1

Inhalt | Info | Einstellungen | Export | Rechte

Zelgen | Verwalten | Text-/Media-Editor

### Inhalt

**Online-Forum Lehr-Lerneinheit 1**  
Zum Austausch über die zu erarbeitenden Lehrinhalte.  
Beiträge (Ungelesen): 106 (0) Neue Beiträge: 0  
Letzter Beitrag: Sie müssen über den VPN-Client angene... von [srauth1](#), 09. Nov 2012

Video - Podcasts

### Online-Forum Lehr-Lerneinheit 1

Zum Austausch über die zu erarbeitenden Lehrinhalte.

Themen | Info | Einstellungen | Moderatoren | Statistik | Export | Rechte

Neues Thema | Alle auf gelesen setzen | Benachrichtigung für dieses Forum starten

(1 - 10 von 25) zurück | weiter Seite 1

Thema	Angelegt von	Beiträge	Besuche	Letzter Beitrag
Fachliteratur!	<a href="#">ssuess</a>	2	50	09. Nov 2012, 08:38 Von <a href="#">srauth1</a>
Prüfbericht G06- 07. November 2012	<a href="#">pwofff</a>	1	23	08. Nov 2012, 18:15 Von <a href="#">pwofff</a>
Literaturnachweis M...				09. Nov 2012, 09:54
Zugversuch Pro...				07:39
Videos Lehr-Ler...				23:04
Stahlbezeichnung...				15:35
Welche E-Modul...				14:01
Zugversuch Def...				01:04
Feedback [Benachrichtigung aktiv]	<a href="#">mbonnet</a>	4	80	04. Nov 2012, 13:28 Von <a href="#">Istapper</a>
Frage zu DIN Normen im Versuchsprotokoll	<a href="#">fpiehl</a>	1	66	03. Nov 2012, 14:41 Von <a href="#">fpiehl</a>

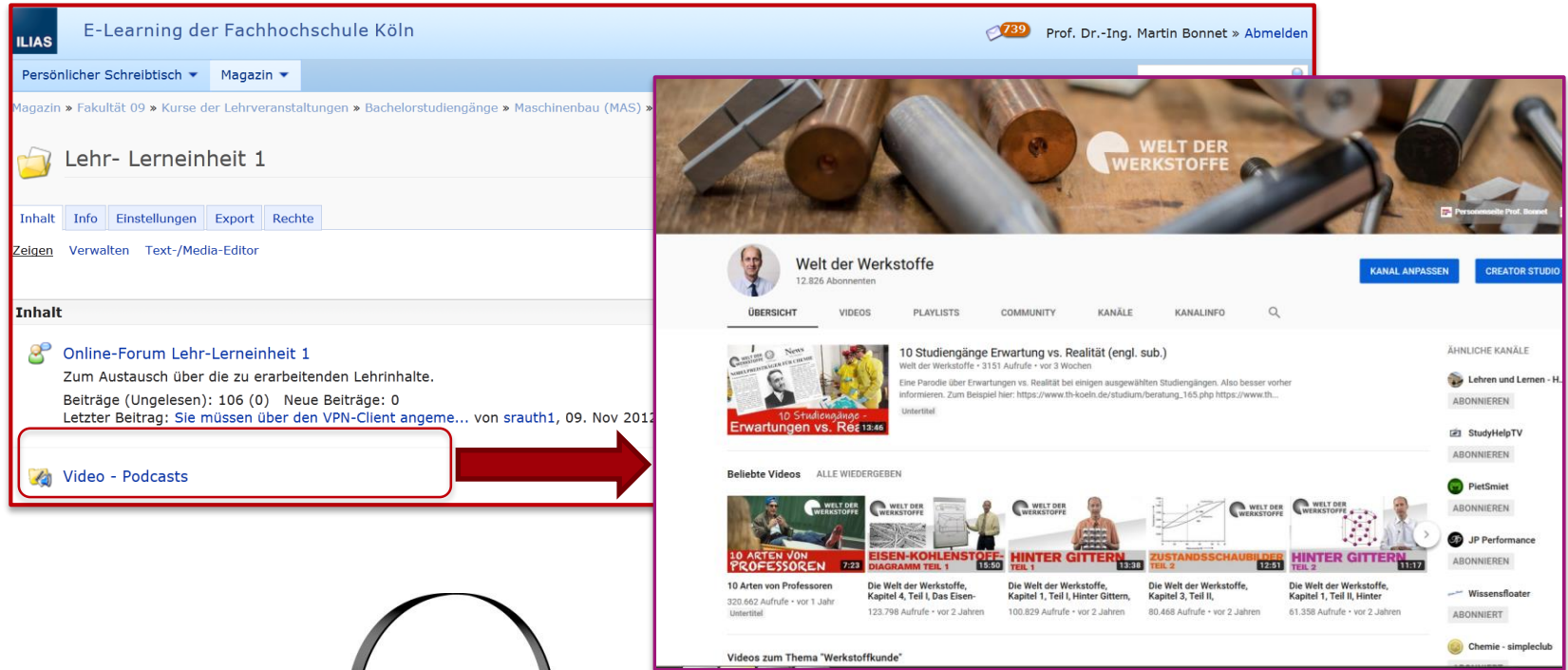
- Up to 2500 visits per forum
- More than 20% of the students actively contributed



Source: TH Köln, Martin Bonnet



# Implementation in ILIAS – Video-Podcasts on YouTube

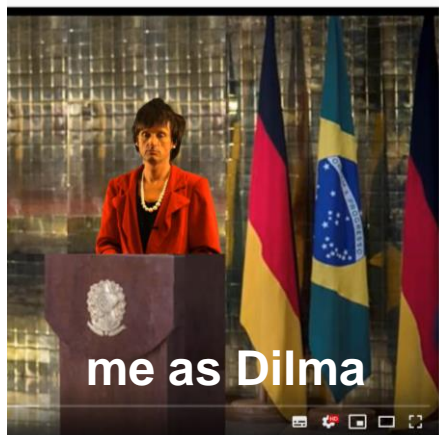


The image shows a screenshot of the ILIAS (Institutional Learning Information System) interface. The top navigation bar includes 'ILIAS', 'E-Learning der Fachhochschule Köln', and a user profile for 'Prof. Dr.-Ing. Martin Bonnet'. The main content area is titled 'Lehr- Lerneinheit 1' and contains a link to 'Video - Podcasts'. A red arrow points from this link to a YouTube channel page for 'Welt der Werkstoffe'. The YouTube page shows the channel's profile, subscriber count (12,826), and a list of videos, including '10 Studiengänge Erwartung vs. Realität (engl. sub.)' and '10 Arten von Professoren'.



Source: TH Köln, Martin Bonnet

... and when I am fed up with energy policy, teaching, ...



# Should SDEWES Community

have its own

# Open Educational Resources

platform?



# SDEWES

# Open Educational Resources

## Platform

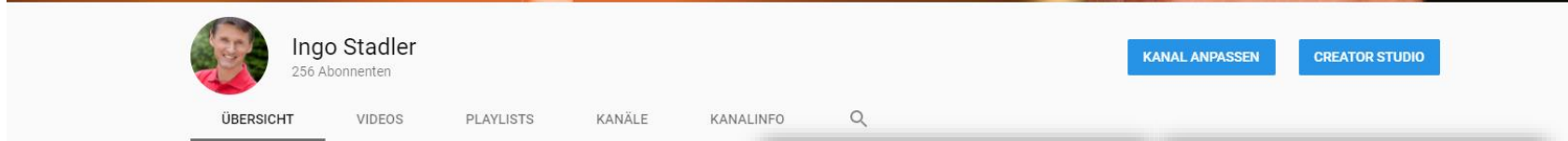
(with high quality and peer-reviewed content)

15TH CONFERENCE ON  
SUSTAINABLE DEVELOPMENT  
OF ENERGY, WATER AND  
ENVIRONMENT SYSTEMS

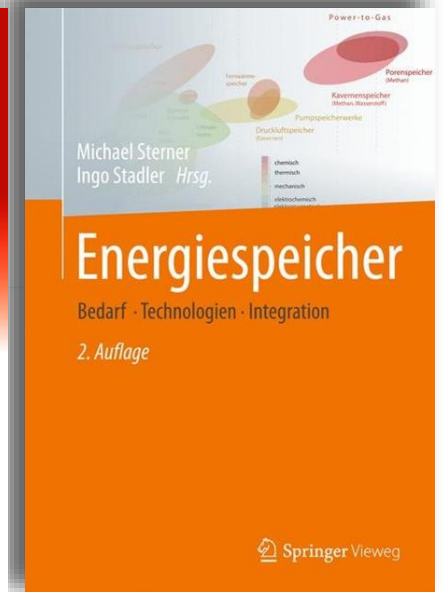
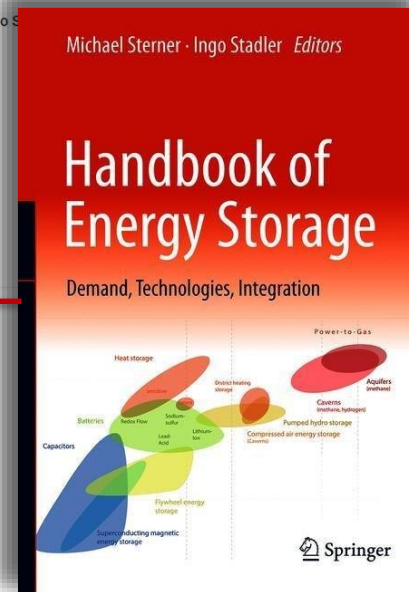


**SEPTEMBER** 1-5, 2020  
COLOGNE, **GERMANY**

Technology  
Arts Sciences  
TH Köln



Trailer youtube Kanal Ingo S  
987 Aufrufe • vor 1 Jahr



[youtube.com/IngoStadler](https://youtube.com/IngoStadler)

Since monday: available as eBook



# AWARD CEREMONY



# AWARD COMMITTEE

**Prof. Natasa Markovska**

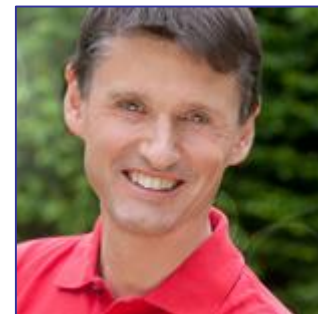
**Prof. Brian Vad Mathiesen**

**Prof. Simeon Oka**

**Prof. Antonio Piacentino**

**Prof. Ingo Stadler**

**Prof. Aleksander Zidanšek**

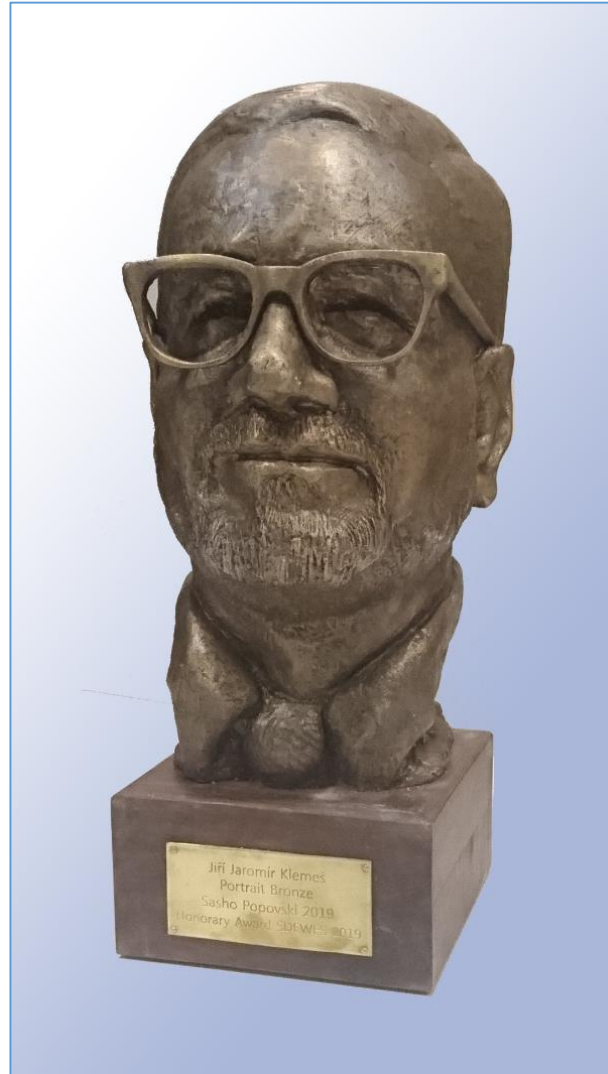




# HONORARY AWARD



# HONORARY AWARD





## Prof. Jiří Jaromír Klemeš







**BEST PAPER AWARD**

## 3<sup>rd</sup> BEST PAPER AWARD



**Usman Safder**

**Sustainable power production by optimal energy recovery and waste treatment with PRO membrane based on a ChExPA (chemical exergy pinch analysis) – Industrial application in a sugar mill plant**

**by Usman Safder, Pouya Ifae, Kijeon Nam, Changkyoo Yoo\***

## 2<sup>nd</sup> BEST PAPER AWARD



# Robert Černý

## Preparation of Self-heating Geopolymers Using Industrial Waste Products

by Václav Kočí, Michaela Petrikova, Jan Fořt, Lukáš Fiala, Robert Černý



# BEST PAPER AWARD



## Gwenny Thomassen

## A Review on Learning Effects in Prospective Technology Assessment

by Gwenny Thomassen, Steven Van Passel, Jo Dewulf



LOYALTY AWARD



# Young-Kwon Park







**Prince Sultan Bin Abdulaziz  
International Prize for Water**

---

Recognizing Innovation



PSIPW's founder  
**HRH Prince Sultan Bin Abdulaziz**  
(1930 - 2011)



**Prince Sultan Bin Abdulaziz  
International Prize for Water**

**Recognizing Innovation**

**“ It is going to take effective management, international commitment, and political strength to avert the impending water crisis. Even this will not be enough without the committed efforts of scientists and researchers to provide the innovative solutions and technology that we need. They must be given every encouragement. ”**

**- HRH Prince Khaled Bin Sultan, PSIPW Chairman**



## **Prince Sultan Bin Abdulaziz International Prize for Water**



**Surface Water  
Prize**



**Groundwater  
Prize**



**Alternative Water  
Resources Prize**



**Water Management &  
Protection Prize**





**Prince Sultan Bin Abdulaziz  
International Prize for Water**



# Invitation for Nominations

# 9<sup>th</sup> Award (2020)

**Nominations open online  
until 31 December 2019**



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***Model assessment of the efficiency of  
water utility companies: approach to the  
analysis of resources and results***

**Prof. Aleksandr Tskhai**