

### **Estimation of the largest expected photovoltaic power ramp rates**

Photovoltaic (PV) systems are prone to irradiance variation caused by cloud shadows leading to fluctuations in generated power. Since these fluctuations can be harmful to the operation of power grids, there is a need to restrict the largest PV power ramp rates (RR). This article proposes a method to estimate the largest expected PV power RRs. The only inputs of the method are the minimum PV system dimension and the measurements of point irradiance and cloud shadow velocity. Since cloud shadows cause the largest power RRs for well-designed large-scale PV power plants, the relation between the largest RRs in irradiance and power during partial cloud shading events was studied based on irradiance measurements. The largest RRs in PV power are estimated from RRs in the average irradiance across the PV system. The proposed method was validated using measured data of 57 days from two PV systems. It showed superior performance compared to an existing method enveloping the RR in the measured power over 99.99% of the time. The method can be used in design and component sizing of PV power plants.

#### **General information**

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Organisations: Electrical Engineering, Research group: Power systems, Research area: Power engineering, University of California

Contributors: Lappalainen, K., Wang, G. C., Kleissl, J.

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Research output: Contribution to journal > Article > Scientific > peer-review

### **Physicochemical and elemental analyses of sandstone quarrying wastes to assess their impact on soil properties**

The use of sandstone as a building material has increased around the world and sandstone quarrying and its wastes pose a potential threat to human health and the environment. More than 50% of the excavated stone is wasted in the form of scrap stone and waste slurry during sandstone quarrying and processing. Sandstone wastes can adversely change native soil properties and should be reused as construction material. The present study aimed to characterise wastes generated during sandstone quarrying and processing, assess their impact on the soil environment and explore their reuse potential. The results of this study show that fine slurry waste has physicochemical properties between sand and sandy loam while the properties of the slurry solids and scrap stone are similar to those of sandstone. Fine stone waste on intrusion into soil reduced the hydraulic conductivity and porosity of soil potentially reducing its productivity. The liquid stone slurry contained metals like Mn, Ni and As at concentrations higher than drinking water standards. These metals may contaminate water sources and affect human health. Therefore, the use of stone wastes as aggregate for road and building construction would be beneficial and would reduce their adverse impacts on the environment.

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Organisations: Materials Science and Environmental Engineering, Indian Institute of Technology Kharagpur

Contributors: Singhal, A., Goel, S., Sengupta, D.

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### **Terrestrial laser scanning for non-destructive estimates of liana stem biomass**

Lianas are important and yet understudied components of tropical forests. Recent studies have shown that lianas are increasing in abundance and biomass in neotropical forests. However, aboveground biomass estimates of lianas are highly uncertain when calculated from allometric relations. This is mainly because of the limited sample size, especially for large lianas, used to construct the allometric models. Furthermore, the allometry of lianas can be weakly constrained mechanically throughout its development from sapling to mature form. In this study, we propose to extract liana stem biomass from terrestrial laser scanning (TLS) data of tropical forests. We show good agreement with a concordance correlation coefficient (CCC) of 0.94 between the TLS-derived volume to reference volume from eleven synthetic lianas. We also compare the TLS-derived biomass for ten real lianas in Nouragues, French Guiana, with the biomass derived from all existing allometric equations for lianas. Our results show relatively low CCC values for all the allometric models with the most commonly used pantropical model overestimating the total biomass by up to 133% compared to the TLS-derived biomass. Our study not only facilitates the testing of allometric equations but also enables non-destructive estimation of liana stem biomass. Since lianas are disturbance-adapted plants, liana abundance is likely to increase with increased forest disturbance. Our method will facilitate the long-term monitoring of liana biomass change in regenerating forests after disturbance, which is critical for developing effective forest management strategies.

### **General information**

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Organisations: Computing Sciences, Research group: Inverse Problems, Universiteit Gent, Smithsonian Tropical Research Institute

Contributors: Krishna Moorthy, S. M., Raunonen, P., Van den Bulcke, J., Calders, K., Verbeeck, H.

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Research output: Contribution to journal › Article › Scientific › peer-review

### **Customer-oriented approach in cadastral procedures – Case study from Finland**

This paper is presenting research on with possibilities and benefit of applying a customer-oriented approach in public cadastral procedures. Public service providers have raised awareness towards customer-oriented approaches in their procedures during recent decades. This study discusses the relevance of adopting a new approach in cadastral procedures by presenting a new method to obtain a subdivision procedure. This is done by conducting a literature review followed by a description of this new method in Finnish local government, the city of Tampere. After that, the study presents views of customers involved in the procedure collected by interviews. The results show that customers of the subdivision process value direct contact with authorities to ensure their interests to be taken into consideration. Eventually,

the study proves that new co-operative methods with and within authorities are essential as well re-evaluating organisational culture values and methods.

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Contributors: Sulonen, K., Riekkinen, K., Kotilainen, S.  
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ASJC Scopus subject areas: Forestry, Geography, Planning and Development, Nature and Landscape Conservation, Management, Monitoring, Policy and Law  
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#### Urban housing density and infrastructure costs

Urbanisation is one of the most significant global megatrends and, as a result, major cities are facing multiple challenges. In this study, we contribute to the sustainable urban development debate and examine the relation between housing density and infrastructure costs. The analysis is based on four hypothetical design prototypes and a consistent cost calculation framework. Based on the results, infrastructure costs per capita are the highest in low-density areas and the lowest in high-density areas, if parking is excluded. However, if also construction costs of parking structures are included, the costs per capita are the highest in high-density areas. Considering the notably high cost impact of parking structures and people's limited willingness to pay for parking, municipally zoned parking requirements in urban areas are likely to result in non-optimal land use. Furthermore, construction in poor soil conditions may only be considered feasible if the floor area ratio and residential densities are relatively high. Beyond the cost benefits, the number of residents that may be accommodated is crucial and higher density in central urban locations should be promoted. We also suggest the cost of urban greenness to be reasonable relative to its many reported benefits and conclude that denser urban structure should not be pursued at the expense of green spaces.

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Organisations: Civil Engineering, Research group: Responsible Construction  
Contributors: Kurvinen, A., Saari, A.  
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Research output: Contribution to journal > Article > Scientific > peer-review

### Potential of renewable fuel to reduce diesel exhaust particle emissions

The use of fossil fuels in traffic is a significant source of air pollutants and greenhouse gases in rapidly growing and densely populated cities. Diesel exhaust emissions including particle number concentration and size distribution along with the particles' chemical composition and NO<sub>x</sub> were investigated from a Euro 4 passenger car with a comprehensive set of high time-resolution instruments. The emissions were compared with three fuel standards – European diesel (EN590), Indian diesel (BS IV) and Finnish renewable diesel (Neste MY) – over the New European Driving Cycle (NEDC) and the Worldwide harmonized Light vehicles Test Cycle (WLTC). Fuel properties and driving conditions strongly affected exhaust emissions. The exhaust particulate mass emissions for all fuels consisted of BC (81–88%) with some contribution from organics (11–18%) and sulfate (0–3%). As aromatic-free fuel, the MY diesel produced around 20% lower black carbon (BC) emissions compared to the EN590 and 29–40% lower compared to the BS IV. High volatile nanoparticle concentrations at high WLTC speed conditions were observed with the BS IV and EN590 diesel, but not with the sulfur-free MY diesel. These nanoparticles were linked to sulfur-driven nucleation of new particles in cooling dilution of the exhaust. For all the fuels non-volatile nanoparticles in sub-10 nm particle sizes were observed during engine braking, and they were most likely formed from lubricant-oil-originated compounds. With all the fuels, the measured particulate and NO<sub>x</sub> emissions were significantly higher during the WLTC cycle compared to the NEDC cycle. This study demonstrated that renewable diesel fuels enable mitigations of particulate and climate-warming BC emissions of traffic, and will simultaneously help tackle urban air quality problems.

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Organisations: Physics, Department of Automotive and Mechanical Engineering, Metropolia University of Applied Sciences, Finnish Meteorological Institute, The Energy and Resources Institute India, Neste Oyj

Contributors: Pirjola, L., Kuuluvainen, H., Timonen, H., Saarikoski, S., Teinilä, K., Salo, L., Datta, A., Simonen, P., Karjalainen, P., Kulmala, K., Rönkkö, T.

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EXT="Pirjola, Liisa"

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Research output: Contribution to journal > Article > Scientific > peer-review

**Building university-industry co-innovation networks in transnational innovation ecosystems: Towards a transdisciplinary approach of integrating social sciences and artificial intelligence**

This paper presents a potential solution to fill a gap in both research and practice that there are few interactions between transnational industry cooperation (TIC) and transnational university cooperation (TUC) in transnational innovation ecosystems. To strengthen the synergies between TIC and TUC for innovation, the first step is to match suitable industrial firms from two countries for collaboration through their common connections to transnational university/academic partnerships. Our proposed matching solution is based on the integration of social science theories and specific artificial intelligence (AI) techniques. While the insights of social sciences, e.g., innovation studies and social network theory, have potential to answer the question of why TIC and TUC should be looked at as synergetic entities with elaborated conceptualization, the method of machine learning, as one specific technique of AI, can help answer the question of how to realize that synergy. On the way towards a transdisciplinary approach to TIC and TUC synergy building, or creating transnational university-industry co-innovation networks, the paper takes an initial step by examining what the supports and gaps of existing studies on the topic are, and using the context of EU-China science, technology and innovation cooperation as a testbed. This is followed by the introduction of our proposed approach and our suggestions for future research.

### General information

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Contributors: Cai, Y., Ferrer, B. R., Lastra, J. L. M.

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### The potential of biomethane in replacing fossil fuels in heavy transport-a case study on Finland

Electrification is a frequently discussed solution for reducing transport related carbon dioxide emissions. However, transport sectors such as aviation and heavy-duty vehicles remain dependent on on-board fuels. Here, biomethane is still a little exploited solution, and the case of heavy-duty vehicles is particularly underappreciated despite the recent technical advances and potentially notable emission reductions. This paper discusses the potential of biomethane in heavy-duty road transport in the case of Finland, where the utilization rate is low compared to the technical potential. To this end, the potential of biomethane production through both anaerobic digestion and gasification was calculated in three scenarios for the heavy-duty transport fleet, based on the literature values of biomethane potential and truck class fuel consumption. The authors find that approximately half of the heavy-duty transport in Finland could be biomethane fueled by 2030. The estimated production costs for biomethane (81-190 €/MWh) would be competitive with the current consumer diesel price (152 €/MWh). Utilizing the total biomethane potential in heavy-duty transport would furthermore decrease the respective carbon dioxide emissions by 50%. To accelerate the transition in the heavy-duty transport sector, a more comprehensive political framework is needed, taking into account both production and consumption.

### General information

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Organisations: Research group: Bio- and Circular Economy, Materials Science and Environmental Engineering, MAB

Powertec Oy, Tampere University

Contributors: Pääkkönen, A., Aro, K., Aalto, P., Konttinen, J., Kojo, M.  
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Research output: Contribution to journal › Article › Scientific › peer-review

#### The potential of electric trucks – An international commodity-level analysis

Development of battery technology is making battery electric heavy duty trucks technically and commercially viable and several manufacturers have introduced battery electric trucks recently. However, the national and sectoral differences in freight transport operations affect the viability of electric trucks. The aim of this paper is to develop a methodology for estimating the potential of electric trucks and demonstrate the results in Switzerland and Finland. Commodity-level analysis of the continuous road freight survey data were carried out in both countries. As much as 71% of Swiss road freight transport tonne-kilometers may be electrified using battery electric trucks but Finland has very limited potential of 35%, due to the use of long and heavy truck-trailer combinations. Within both countries the electrification potential varies considerably between commodities, although in Finland more so than in Switzerland. Commodities which are constrained by payload volume rather than weight and are to large extent carried using medium duty or <26t rigid trucks seem to provide high potential for electrification even with the current technology. Electric trucks increase the annual electricity consumption by only 1–3%, but truck charging is likely to have a large impact on local grids near logistics centres and rest stations along major roads. A spatial analysis by routing the trips reported in the datasets used in this study should be carried out. Future research should also include comparison between the alternate ways of electrifying road freight transport, i.e. batteries with charging, batteries with battery swapping and electrified road systems.

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Contributors: Liimatainen, H., van Vliet, O., Aplyn, D.

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Research output: Contribution to journal > Article > Scientific > peer-review

### **Semi-continuous mono-digestion of OFMSW and Co-digestion of OFMSW with beech sawdust: Assessment of the maximum operational total solid content**

In this study, mono-digestion of the organic fraction of municipal solid waste (OFMSW) and co-digestion of OFMSW with beech sawdust, simulating green waste, were used to investigate the maximum operational total solid (TS) content in semi-continuous high-solids anaerobic digestion (HS-AD). To alleviate substrate overloading in HS-AD, the effluent mass was relatively reduced compared to the influent mass, extending the mass retention time. To this aim, the reactor mass was daily evaluated, permitting to assess the reactor content removal by biogas production. During mono-digestion of OFMSW, the  $\text{NH}_3$  inhibition and the rapid TS removal prevented to maintain HS-AD conditions (i.e.  $\text{TS} \geq 10\%$ ), without exacerbating the risk of reactor acidification. In contrast, the inclusion of sawdust in OFMSW permitted to operate HS-AD up to 30% TS, before acidification occurred. Therefore, including a lignocellulosic substrate in OFMSW can prevent acidification and stabilize HS-AD at very high TS contents (i.e. 20–30%).

#### **General information**

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Organisations: Chemistry and Bioengineering, Research group: Bio- and Circular Economy, University of Cassino and Southern Lazio, ENEA/CREATE/Università Degli Studi Napoli Federico II, University of Montpellier, University of Montpellier

Contributors: Pastor-Poquet, V., Papirio, S., Trably, E., Rintala, J., Escudié, R., Esposito, G.

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EXT="Papirio, Stefano"

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Research output: Contribution to journal > Article > Scientific > peer-review

### **Characteristics of particle emissions and their atmospheric dilution during co-combustion of coal and wood pellets in a large combined heat and power plant**

Coal combustion is one of the most significant anthropogenic  $\text{CO}_2$  and air pollution sources globally. This paper studies the atmospheric emissions of a power plant fuelled with a mixture of industrial pellets (10.5%) and coal (89.5%). Based on the stack measurements, the solid particle number emission, which was dominated by sub-200 nm particles, was  $3.4 \times 10^{11} \text{ MJ}^{-1}$  for the fuel mixture when electrostatic precipitator (ESP) was cleaning the flue gas. The emission factor was  $50 \text{ mg MJ}^{-1}$  for particulate mass and  $11\,740 \text{ ng MJ}^{-1}$  for the black carbon with the ESP. In the normal operation situation of the power plant, i.e., including the flue-gas desulphurisation and fabric filters (FGD and FF), the particle number emission factor was  $1.7 \times 10^8 \text{ MJ}^{-1}$ , particulate mass emission factor  $2 \text{ mg MJ}^{-1}$  and black carbon emission factor  $14 \text{ ng MJ}^{-1}$ . Transmission electron microscopy (TEM) analysis supported the particle number size distribution measurement in terms of particle size and the black carbon concentration. The TEM images of the particles showed variability of the particle sizes,

morphologies and chemical compositions. The atmospheric measurements, conducted in the flue-gas plume, showed that the flue-gas dilutes closed to background concentrations in 200 sec. However, an increase in particle number concentration was observed when the flue gas aged. This increase in particle number concentration was interpreted as formation of new particles in the atmosphere. In general, the study highlights the importance of detailed particle measurements when utilizing new fuels in existing power plants. Implications: CO<sub>2</sub> emissions of energy production decrease when substituting coal with biofuels. The effects of fuels changes on particle emission characteristics have not been studied comprehensively. In this study conducted for a real-scale power plant, co-combustion of wood pellets and coal caused elevated black carbon emissions. However, it was beneficial from the total particle number and particulate mass emission point of view. Flue-gas cleaning can significantly decrease the pollutant concentrations but also changes the characteristics of emitted particles. Atmospheric measurements implicated that the new particle formation in the atmospheric flue-gas plume should be taken into account when evaluating all effects of fuel changes." Are implication statements part of the manuscript?.

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Organisations: Physics, Metropolia University of Applied Sciences, Finnish Meteorological Institute, Servicio Meteorológico Nacional, Pegasor Oyj, Helen Oy, Dekati Ltd, Valmet Technologies Oy

Contributors: Mylläri, F., Pirjola, L., Lihavainen, H., Asmi, E., Saukko, E., Laurila, T., Vakkari, V., O'Connor, E., Rautiainen, J., Häyrynen, A., Niemelä, V., Maunula, J., Hillamo, R., Keskinen, J., Rönkkö, T.

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### Technology valuation method for supporting knowledge management in technology decisions to gain sustainability

New technologies have major effects on the profitability of companies and the economic growth of society. If appropriate technologies can be routinely selected, then it is possible to achieve sustainability at a company level. Knowledge management (KM) can be used to support technology decision making and give an understanding of the potential of particular technologies in a specific business environment. In this study, the design research methodology (DRM) is used with three case studies in an industry environment to develop and evaluate a novel technology valuation method (TVM). The proposed six-step TVM focuses on the acquisition, modeling, and validation of product-related knowledge to support KM related to technology decisions. The contribution of this research is to use distinctions between product properties and behaviors with a disposition toward understanding the potential of technology. During the process, tacit knowledge is made visible and documented, which supports the reliability of technology decisions and enables companies to gain sustainability.

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Contributors: Mämmelä, J., Juuti, T., Julkunen, P.

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EXT="Julkunen, Pasi"

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### A comparative analysis of global datasets and initiatives for urban health and sustainability

Globally, urban populations are growing rapidly, and in most cases their demands for resources are beyond current limits of sustainability. Cities are therefore critical for achieving national and international sustainability objectives, such as greenhouse gas reduction. Improving sustainability may also provide opportunities for urban population health co-benefits by reducing unhealthy exposures and behaviours. However, there is currently sparse empirical evidence on the degree to which city characteristics are associated with variations in health-related exposures, behaviours and sustainability. This paper examines the feasibility of aggregating empirical data relating to sustainability and health for global cities. An initial scoping review of existing English-language datasets and networks is performed. Resulting datasets are analysed for data types, collection method, and the distribution of contributing cities across climates, population sizes, and wealth. The review indicates datasets are populated using inconsistent methodologies and metrics and have poor overlap of cities between them. Data and organisations tend to be biased towards larger and wealthier cities, and concentrated in Europe and North America. Therefore, despite vast amounts of available data, limitations of reliability, representativeness, and disparate sources mean researchers are faced with significant obstacles when aggregating data to analyse the sustainability and health of globally representative samples of cities.

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Organisations: University College London, London School of Hygiene and Tropical Medicine, The Energy and Resources Institute India, Fiocruz Bahia

Contributors: Taylor, J., Haines, A., Milner, J., Davies, M., Wilkinson, P., Sehgal, M., Singh, K. N., Barreto, M., Vianna, N., Teles, C.

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<http://www.scopus.com/inward/record.url?scp=85054722697&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 85054722697

Research output: Contribution to journal > Article > Scientific > peer-review

### **Production of alkanes from CO<sub>2</sub> by engineered bacteria**

Background: Microbial biosynthesis of alkanes is considered a promising method for the sustainable production of drop-in fuels and chemicals. Carbon dioxide would be an ideal carbon source for these production systems, but efficient production of long carbon chains from CO<sub>2</sub> is difficult to achieve in a single organism. A potential solution is to employ acetogenic bacteria for the reduction of CO<sub>2</sub> to acetate, and engineer a second organism to convert the acetate into long-chain hydrocarbons. Results: In this study, we demonstrate alkane production from CO<sub>2</sub> by a system combining the acetogen *Acetobacterium woodii* and a non-native alkane producer *Acinetobacter baylyi* ADP1 engineered for alkane production. Nine synthetic two-step alkane biosynthesis pathways consisting of different aldehyde- and alkane-producing enzymes were combinatorically constructed and expressed in *A. baylyi*. The aldehyde-producing enzymes studied were AAR from *Synechococcus elongatus*, Acr1 from *A. baylyi*, and a putative dehydrogenase from *Nevskia ramosa*. The alkane-producing enzymes were ADOs from *S. elongatus* and *Nostoc punctiforme*, and CER1 from *Arabidopsis thaliana*. The performance of the pathways was evaluated with a twin-layer biosensor, which allowed the monitoring of both the intermediate (fatty aldehyde), and end product (alkane) formation. The highest alkane production, as indicated by the biosensor, was achieved with a pathway consisting of AAR and ADO from *S. elongatus*. The performance of this pathway was further improved by balancing the relative expression levels of the enzymes to limit the accumulation of the intermediate fatty aldehyde. Finally, the acetogen *A. woodii* was used to produce acetate from CO<sub>2</sub> and H<sub>2</sub>, and the acetate was used for alkane production by the engineered *A. baylyi*, thereby leading to the net production of long-chain alkanes from CO<sub>2</sub>. Conclusions: A modular system for the production of drop-in liquid fuels from CO<sub>2</sub> was demonstrated. Among the studied synthetic pathways, the combination of ADO and AAR from *S. elongatus* was found to be the most efficient in heterologous alkane production in *A. baylyi*. Furthermore, limiting the accumulation of the fatty aldehyde intermediate was found to be beneficial for the alkane production. Nevertheless, the alkane productivity of the system remained low, representing a major challenge for future research.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Chemistry and Bioengineering, Research group: Bio- and Circular Economy

Contributors: Lehtinen, T., Virtanen, H., Santala, S., Santala, V.

Publication date: 21 Aug 2018

Peer-reviewed: Yes

### **Publication information**

Journal: *Biotechnology for Biofuels*

Volume: 11

Article number: 228

ISSN (Print): 1754-6834

Ratings:

Scopus rating (2018): CiteScore 8.4 SJR 1.762 SNIP 1.468

Original language: English

ASJC Scopus subject areas: Biotechnology, Applied Microbiology and Biotechnology, Renewable Energy, Sustainability and the Environment, Energy(all), Management, Monitoring, Policy and Law

Keywords: Acetate, Acetogen, *Acinetobacter baylyi* ADP1, Aldehyde, Alkane, Biofuel, Biosensor, Carbon dioxide, CO, Drop in

DOIs:

10.1186/s13068-018-1229-2

### **Bibliographical note**

INT=keb,"Virtanen, Henri"

Source: Scopus

Source ID: 85052519319

Research output: Contribution to journal > Article > Scientific > peer-review

### **Energy consumption of Finnish schools and daycare centers and the correlation to regulatory building permit values**

The national building codes set requirements for building energy efficiency in many countries. The purpose of this study was to improve understanding on the measured and calculated energy efficiency of Finnish schools and daycare centers. The study analyzed the energy consumption of 134 schools and 71 daycare centers and compared the regulatory building permit calculations to measured values for 18 case buildings. According to the results, the specific electricity consumption (kW h/(m<sup>2</sup> a)) has increased in schools but not in daycare centers. The heating energy consumption was lower in schools, but this might be explained by that they had clearly larger gross floor area than daycare centers. When compared to the technical requirements in the building code, the actual heating energy consumption has decreased less than what the changes in the building code would suggest. The building energy consumption calculated for building permits with the monthly calculation method and standard use clearly underestimated the measured building energy consumption. The differences were larger in heating energy than in electricity consumption. In conclusion, different regulatory limit values should be considered for the two building types. The calculation methods and input data should be analyzed to ensure that they truly guide towards cost-optimal design choices.

### General information

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Civil Engineering, Research group: Building Physics  
Contributors: Ruusala, A., Laukkarinen, A., Vinha, J.  
Number of pages: 13  
Pages: 183-195  
Publication date: 1 Aug 2018  
Peer-reviewed: Yes

### Publication information

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Ratings:  
Scopus rating (2018): CiteScore 7.2 SJR 1.988 SNIP 1.825  
Original language: English  
ASJC Scopus subject areas: Energy(all), Management, Monitoring, Policy and Law, Building and Construction, Energy (miscellaneous)  
Keywords: Building permit, Daycare center, Measured building energy consumption, Monthly calculation method, School building, Standard use  
Electronic versions:  
Ruusala et al 2018 Energy consumption - Preprint  
DOIs:  
10.1016/j.enpol.2018.04.029  
URLs:  
<http://urn.fi/URN:NBN:fi:tyy-201808062052>  
Source: Scopus  
Source ID: 85046336515  
Research output: Contribution to journal > Article > Scientific > peer-review

### Metabolic pairing of aerobic and anaerobic production in a one-pot batch cultivation

Background: The versatility of microbial metabolic pathways enables their utilization in vast number of applications. However, the electron and carbon recovery rates, essentially constrained by limitations of cell energetics, are often too low in terms of process feasibility. Cocultivation of divergent microbial species in a single process broadens the metabolic landscape, and thus, the possibilities for more complete carbon and energy utilization. Results: In this study, we integrated the metabolisms of two bacteria, an obligate anaerobe *Clostridium butyricum* and an obligate aerobe *Acinetobacter baylyi* ADP1. In the process, a glucose-negative mutant of *A. baylyi* ADP1 first deoxidized the culture allowing *C. butyricum* to grow and produce hydrogen from glucose. In the next phase, ADP1 produced long chain alkyl esters (wax esters) utilizing the by-products of *C. butyricum*, namely acetate and butyrate. The coculture produced  $24.5 \pm 0.8$  mmol/l hydrogen ( $1.7 \pm 0.1$  mol/mol glucose) and 28 mg/l wax esters (10.8 mg/g glucose). Conclusions: The cocultivation of strictly anaerobic and aerobic bacteria allowed the production of both hydrogen gas and long-chain alkyl esters in a simple one-pot batch process. The study demonstrates the potential of 'metabolic pairing' using designed microbial consortia for more optimal electron and carbon recovery.

### General information

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Chemistry and Bioengineering  
Contributors: Salmela, M., Lehtinen, T., Efimova, E., Santala, S., Mangayil, R.  
Publication date: 3 Jul 2018  
Peer-reviewed: Yes

### Publication information

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Volume: 11  
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Article number: 187  
ISSN (Print): 1754-6834  
Ratings:  
Scopus rating (2018): CiteScore 8.4 SJR 1.762 SNIP 1.468  
Original language: English  
ASJC Scopus subject areas: Biotechnology, Applied Microbiology and Biotechnology, Renewable Energy, Sustainability and the Environment, Energy(all), Management, Monitoring, Policy and Law  
Keywords: Hydrogen production, Integrated metabolism, Metabolic pairing, Synthetic microbial consortia, Wax esters

Electronic versions:

full text

DOIs:

10.1186/s13068-018-1186-9

URLs:

<http://urn.fi/URN:NBN:fi:tty-201808072056>

Source: Scopus

Source ID: 85049884043

Research output: Contribution to journal > Article > Scientific > peer-review

### **Cross-impact analysis of Finnish electricity system with increased renewables: Long-run energy policy challenges in balancing supply and consumption**

Climate change and global economic pressures are strong drivers for energy economies to transition towards climate-neutrality, low-carbon economy and better energy and resource efficiencies. The response to these pressures, namely the increased use of renewable energy, creates a set of new challenges related to supply-demand balance for energy policy and electricity system planning. This study analyses the emergent problems resulting from the renewable energy response. These complex aspects of change in the electricity system are analysed with a cross-impact model based on an expert-driven modeling process, consisting of workshops, panel evaluations and individual expert work. The model is then analysed using a novel computational cross-impact technique, EXIT. The objective of the study is to map the important direct drivers of change in the period 2017–2030 in electricity consumption and production in Finland, construct a cross-impact model from this basis, and discover the emergent and systemic dynamics of the modeled system by analysis of this model.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Electrical Energy Engineering, Automation and Hydraulic Engineering

Contributors: Panula-Ontto, J., Luukkanen, J., Kaivo-oja, J., O'Mahony, T., Vehmas, J., Valkealahti, S., Björkqvist, T., Korpela, T., Järventausta, P., Majanne, Y., Kojo, M., Aalto, P., Harsia, P., Kallioharju, K., Holttinen, H., Repo, S.

Number of pages: 10

Pages: 504-513

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Peer-reviewed: Yes

#### **Publication information**

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Volume: 118

ISSN (Print): 0301-4215

Ratings:

Scopus rating (2018): CiteScore 7.2 SJR 1.988 SNIP 1.825

Original language: English

ASJC Scopus subject areas: Energy(all), Management, Monitoring, Policy and Law

Keywords: Cross-impact analysis, Electricity system, Low-carbon, Renewables, Transition

Electronic versions:

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DOIs:

10.1016/j.enpol.2018.04.009

URLs:

<http://urn.fi/URN:NBN:fi:tty-201805031589>

Source: Scopus

Source ID: 85045762685

Research output: Contribution to journal > Article > Scientific > peer-review

### **Nutrient management via struvite precipitation and recovery from various agroindustrial wastewaters: Process feasibility and struvite quality**

Improving environmental protection and finding sustainable and renewable resources of nutrients are core issues in circular bioeconomy. Thus, this study evaluated the efficiency of recovering struvite,  $\text{MgNH}_4\text{PO}_4 \cdot 6\text{H}_2\text{O}$ , from different agro-industrial wastewaters (four highly loaded reject waters of anaerobically co-digested agro-industrial waste and a raw swine slurry) and assessed the quality of recovered struvite crystals and their reusability as fertilizer. The efficiency of crystallization ( $E_c$  40–80%) and amount of struvite in the precipitate ( $P_p$  55–94%) highly varied due to the characteristics of influent wastewaters, particularly to the content of competing elements, such as alkaline and heavy metals and total solids (TS). In particular,  $E_c$  (94, 75, 61%) and  $P_p$  (76, 66, 48%) decreased at increasing TS (0.57, 0.73, 0.99%), demonstrating the hindering effect of solid content on struvite recovery and quality. According to X-ray diffraction analysis, the structure of all isolated samples corresponded to crystalline, orthorhombic struvite, which exhibited high purity (32–48

g/kg<sub>d</sub> N, 114–132 g/kg<sub>d</sub> P, and 99–116 g/kg<sub>d</sub> Mg) containing only a few foreign elements, whose amount depended on the characteristics of the influent wastewater. All struvite contained other plant macronutrients (K, Ca) and many micronutrients (Fe, Na, Cu, Mn, Co, Zn) that further enhance its agronomic value. Therefore, this study showed that struvite can be successfully recovered from a wide range of highly loaded agroindustrial wastewaters, and that the quality of the recovered struvite could be suitable for reuse in agriculture.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Chemistry and Bioengineering, Materials Science, OY Scandinavian Colloids Ltd

Contributors: Taddeo, R., Honkanen, M., Kolppo, K., Lepistö, R.

Number of pages: 7

Pages: 433-439

Publication date: 15 Apr 2018

Peer-reviewed: Yes

#### Publication information

Journal: Journal of Environmental Management

Volume: 212

ISSN (Print): 0301-4797

Ratings:

Scopus rating (2018): CiteScore 6.9 SJR 1.206 SNIP 1.774

Original language: English

ASJC Scopus subject areas: Environmental Engineering, Waste Management and Disposal, Management, Monitoring, Policy and Law

Keywords: Crystalline purity, Heavy metals, Nutrient recycling, Solid content, Sustainable fertilizer

DOIs:

10.1016/j.jenvman.2018.02.027

#### Bibliographical note

EXT="Kolppo, Kari"

Source: Scopus

Source ID: 85042109316

Research output: Contribution to journal > Article > Scientific > peer-review

#### Techno-economic evaluation of integrating torrefaction with anaerobic digestion

In recent days, the interest on torrefaction is increasing owing to its ability to improve biomass properties to a level of competing with coal. However, its techno-economic feasibility still need to be optimized. Integrating torrefaction with other thermochemical and biochemical processes could be a feasible option to improve the performance of the torrefaction process. In that regard, this study evaluates the techno-economic feasibility of integrating the torrefaction with anaerobic digestion (AD). In addition, new process configurations were studied to identify the possible heat energy recovery options. Technical feasibility was tested through mass and energy balance at each process unit. The economic indicators such as net present value (€), minimum selling price and internal rate on return (%) were used to evaluate the economic performance. At 10 t/h of torrefied biomass pellets production capacity, the estimated bio-methane production from AD was 369 m<sup>3</sup>/h. The economic evaluation shows that the minimum selling price of the torrefied biomass to reach the breakeven could be reduced from 199 €/t for standalone torrefaction to 185 €/t in case of torrefaction integrated with AD. The sensitivity analysis shows that feedstock and total capital investment were the most sensitive input parameters. This study shows that integrating the torrefaction with AD has better technical and economic feasibility than standalone torrefaction.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Chemistry and Bioengineering, Research group: Bio- and Circular Economy

Contributors: Doddapaneni, T. R. K. C., Praveenkumar, R., Tolvanen, H., Rintala, J., Konttinen, J.

Number of pages: 13

Pages: 272-284

Publication date: 2018

Peer-reviewed: Yes

Early online date: Jan 2018

#### Publication information

Journal: Applied Energy

Volume: 213

ISSN (Print): 0306-2619

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Original language: English

ASJC Scopus subject areas: Civil and Structural Engineering, Building and Construction, Energy(all), Mechanical Engineering, Management, Monitoring, Policy and Law

Keywords: Energy recovery, Minimum selling price, Process integration, Techno-economic analysis, Torrefaction – anaerobic digestion, Torrefied pellets

DOIs:

10.1016/j.apenergy.2018.01.045

Source: Scopus

Source ID: 85041461877

Research output: Contribution to journal › Article › Scientific › peer-review

### **Landowners' willingness to promote bioenergy production on wasteland – future impact on land use of cutaway peatlands**

Landowners are the key players in bioenergy production on wasteland; such as cutaway peatlands. In this study, the landowner's interest to use cutaway peatlands for bioenergy production was investigated using a survey and GIS (Geographic Information Systems) methods in an area in South Ostrobothnia, Finland. The focus was to identify which different bioenergy production chains are preferred by the respondents: combustion, gasification or biogas production from agriculture, energy-willow short-rotation forestry or forestry based energy crops. Also, the influence of personal environmental values on the selection was measured and the future impacts and barriers for the land use were assessed. Afforestation was the most popular after-use method among the landowners. The next most favorable method was energy crop cultivation but it was highly dependent on economic profitability and subsidies. Currently, approximately 8.2% or 500 ha of the total peat extraction area could be used for bioenergy production in the region by 2035. Based on the survey, forest based biomass is the best option if bioenergy is to be produced. The next choice was agro biomass and the least favored plant was willow. This study suggests that the biggest cutaway peatlands will be converted to forest energy in the future. Suggestive results were that the owners with high environmental values are especially interested in agro biomass growing and the landowner having a distant home place does not have a negative influence on bioenergy production. Altogether, land use and biomass production of cutaway peatlands is connected with the demands of the Finnish bio-economy.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Chemistry and Bioengineering, Research group: Bio- and Circular Economy, Jyväskylän yliopisto, Seinäjoki University of Applied Sciences

Contributors: Laasasenaho, K., Lensu, A., Rintala, J., Lauhanen, R.

Number of pages: 9

Pages: 167-175

Publication date: 1 Dec 2017

Peer-reviewed: Yes

### **Publication information**

Journal: Land Use Policy

Volume: 69

ISSN (Print): 0264-8377

Ratings:

Scopus rating (2017): CiteScore 5.1 SJR 1.348 SNIP 1.76

Original language: English

ASJC Scopus subject areas: Forestry, Geography, Planning and Development, Nature and Landscape Conservation, Management, Monitoring, Policy and Law

Keywords: Biogas, Combustion, Energy crop, Gasification, GIS, Willow

DOIs:

10.1016/j.landusepol.2017.09.010

URLs:

<http://urn.fi/URN:NBN:fi:tuni-201910033675>. Embargo ends: 19/09/20

Source: Scopus

Source ID: 85029532718

Research output: Contribution to journal › Article › Scientific › peer-review

### **Change program management: Toward a capability for managing value-oriented, integrated multi-project change in its context**

Program management has taken its position in project management research and in public and private organizations as a successful method for managing complex, uncertain, and large-scale changes. During the past 25. years, research has evolved from programs as the conceptual extension of projects to a rich field of empirical studies reflecting the special natures and contexts of change programs and their management, with unique theoretical foundations. To take stock of this

recent history, in this article we analyze the patterns of previous empirical studies on change program management and their theoretical foundations. The goal is to identify and summarize proposals to guide forthcoming program management research. The results reveal three main themes of ongoing research: managing over the change program lifecycle, managing programs in their context, and program managers' capabilities. The roots of change program management in organization theories are apparent; structural contingency theory and information processing theories have dominated in previous empirical research, but are clearly being extended to agency, stakeholder, and actor-network theories. New research ideas are proposed for the use of programs in various types of changes, value creation and delivery through change programs, the profiles and capabilities of different actors in program management, the coexistence and interplay of multiple programs, and the complex stakeholder networks involved with change programs. When change becomes more prevalent in the organizations' dynamic contexts, there is an increasing need to develop program management toward an organizational capability for managing value-oriented, integrated, and multi-project change in complex stakeholder contexts.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Industrial and Information Management, Research group: Center for Research on Operations Projects and Services, City of Espoo

Contributors: Martinsuo, M., Hoverfält, P.

Pages: 134 – 146

Publication date: Dec 2017

Peer-reviewed: Yes

#### **Publication information**

Journal: International Journal of Project Management

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Issue number: 1

ISSN (Print): 0263-7863

Ratings:

Scopus rating (2017): CiteScore 9.1 SJR 1.463 SNIP 2.795

Original language: English

ASJC Scopus subject areas: Business and International Management, Management, Monitoring, Policy and Law, Management of Technology and Innovation

Keywords: Change, Change programs, Context, Multi-project, Organizational change program management, Program lifecycle

DOIs:

10.1016/j.ijproman.2017.04.018

Source: Scopus

Source ID: 85020101972

Research output: Contribution to journal › Article › Scientific › peer-review

#### **Sustainable project management through project control in infrastructure projects**

Sustainability is becoming increasingly important in the delivery of projects as stakeholders require ethicality, eco-friendliness, and economic efficiency during a project's life cycle. Previous studies focused on the environmental aspects of sustainability in project deliverables, whereas less attention has been directed at sustainable project management during project delivery. The goal of this study is to identify the control practices that a project organization uses for sustainable project management. A qualitative single-case study was conducted on a large infrastructure project in which a road tunnel was constructed in a highly demanding environment, involving multiple stakeholders in an alliance contract. The results reveal that sustainable project management is implemented using not only indicators but a holistic control package in which control mechanisms are used differently for different sustainability dimensions. Internal project control is complemented with sustainable project governance, linking the project to its external stakeholders and regulations. The alliance contract activates the partners to exploit innovation opportunities and, thus, promotes economic, environmental, and social sustainability.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Industrial and Information Management, Research group: Center for Research on Operations Projects and Services

Contributors: Kivilä, J., Martinsuo, M., Vuorinen, L.

Pages: 1167 – 1183

Publication date: Aug 2017

Peer-reviewed: Yes

Early online date: 1 Mar 2017

### Publication information

Journal: International Journal of Project Management

Volume: 35

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ISSN (Print): 0263-7863

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Scopus rating (2017): CiteScore 9.1 SJR 1.463 SNIP 2.795

Original language: English

ASJC Scopus subject areas: Business and International Management, Management, Monitoring, Policy and Law, Management of Technology and Innovation

Keywords: Alliance, Project control, Public-private partnership (PPP), Sustainability, Sustainability indicators, Sustainable project management

Electronic versions:

Sustainable project management through project control 2017. Embargo ended: 1/03/20

DOIs:

10.1016/j.ijproman.2017.02.009

URLs:

<http://urn.fi/URN:NBN:fi:tuni-202001271575>. Embargo ended: 1/03/20

Source: Scopus

Source ID: 85014064572

Research output: Contribution to journal › Article › Scientific › peer-review

### Project change stakeholder communication

This action-based qualitative case study explores how the project communication routines affect stakeholder engagement during change management process and evolve project culture. With an inductive design, this research studies change communication practices in two different case contexts. The results underline the fact that an effective communication ensures stakeholder participation in the change management processes through teamwork and empowerment, whereas lacking communication routines lead to a rational and straightforward project culture where task performance and efficiency are preferred over stakeholder involvement. Theoretical results suggest that project communication planning requires more attention on the know-how of stakeholders than the current stakeholder evaluation models instruct.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Civil Engineering, Research group: Digitalization in the real estate and construction sector, University of Vaasa (UVA)

Contributors: Butt, A., Naaranoja, M., Savolainen, J.

Number of pages: 17

Pages: 1579-1595

Publication date: 1 Nov 2016

Peer-reviewed: Yes

### Publication information

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Volume: 34

Issue number: 8

ISSN (Print): 0263-7863

Ratings:

Scopus rating (2016): CiteScore 7.3 SJR 1.434 SNIP 2.872

Original language: English

ASJC Scopus subject areas: Business and International Management, Management, Monitoring, Policy and Law, Management of Technology and Innovation

Keywords: Action research, Change management, Communication management, Project culture, Project management, Stakeholder know-how, Stakeholders

DOIs:

10.1016/j.ijproman.2016.08.010

Source: Scopus

Source ID: 84988039617

Research output: Contribution to journal › Article › Scientific › peer-review

### Sustainable nutrients recovery and recycling by optimizing the chemical addition sequence for struvite precipitation from raw swine slurries

Livestock farming contributes heavily to nitrogen (N) and phosphorus (P) flows into the environment, a major cause of eutrophication of coastal and freshwater systems. Furthermore, the growing demand for N-P fertilizers is increasing the

emission of anthropogenic reactive N into the atmosphere and the depletion of the current P reserves. Therefore, it is essential to minimize the anthropogenic impact on the environment and recycle the wasted N-P for agricultural reuse. This study focused on enhancing struvite ( $\text{MgNH}_4\text{PO}_4 \cdot 6\text{H}_2\text{O}$ ) precipitation from raw swine slurries in batch and laboratory-scale reactors. Different chemical addition sequences were evaluated, and the best removal efficiency (E%) was obtained when the chemicals were mixed before the precipitation process. Struvite was detected at a pH as low as 6 (E%N-P~50%), and high E%N-P was found at pH 7–9.5 (80–95%). Furthermore, air stripping was used in place of NaOH to adjust pH, returning the same efficiency as if only alkali had been used. XRD and FE-SEM analysis of the precipitate showed that the recovered struvite was of high purity with orthorhombic crystalline structure and only trace amounts of impurities from matrix organics, co-precipitation products (CaO and amorphous calcium-phosphates), and residuals of added chemicals (MgO).

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Chemistry and Bioengineering, Department of Materials Science

Contributors: Taddeo, R., Kolppo, K., Lepistö, R.

Number of pages: 7

Pages: 52-58

Publication date: 15 Sep 2016

Peer-reviewed: Yes

#### Publication information

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ISSN (Print): 0301-4797

Ratings:

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ASJC Scopus subject areas: Environmental Engineering, Waste Management and Disposal, Management, Monitoring, Policy and Law

Keywords: Air stripping, Chemical addition, Crystallization, Manure management, Nutrients recycling, Struvite

DOIs:

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Source: Scopus

Source ID: 84978733912

Research output: [Contribution to journal](#) › [Article](#) › [Scientific](#) › [peer-review](#)

#### Enhancing the supplier's non-contractual project relationships with designers

Project delivery involves networks of customers, contractors, sub-contractors, suppliers, and designers. Strong interorganizational relationships are considered relevant to project performance. Previous research has focused on contractual relationships in direct supply chains, with little attention to suppliers and their non-contractual relationships. This study develops and tests a framework of relationship strength and its antecedents in the non-contractual relationship between suppliers and designers as third parties in construction projects. The intent is to identify the key factors relevant to enhancing the supplier's non-contractual relationships with designers. The results reveal the supplier's activeness and technical capability as antecedents to trust, and supplier's technical capability and supplier-designer cooperation beyond project boundaries as antecedents to commitment. The different antecedents of trust and commitment imply alternative pathways for strengthening non-contractual relationships in construction projects, thereby deviating from activities in contractual relationships. Further research is proposed on other types of third parties and other antecedents of commitment.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Industrial Management, Research group: Center for Research on Operations Projects and Services

Contributors: Sariola, R., Martinsuo, M.

Number of pages: 14

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Peer-reviewed: Yes

#### Publication information

Journal: International Journal of Project Management

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Issue number: 6

ISSN (Print): 0263-7863

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Original language: English

ASJC Scopus subject areas: Business and International Management, Management of Technology and Innovation, Management, Monitoring, Policy and Law

Keywords: Commitment, Interorganizational relationship, Non-contractual relationship, Project networks, Relationship strength, Trust

Electronic versions:

Enhancing the supplier's \_final\_withref. Embargo ended: 13/05/19

DOIs:

10.1016/j.ijproman.2016.04.002

URLs:

<http://urn.fi/URN:NBN:fi:tty-201605264183>. Embargo ended: 13/05/18

Source: Scopus

Source ID: 84966270814

Research output: Contribution to journal › Article › Scientific › peer-review

### **Agronomic characteristics of five different urban waste digestates**

The use of digestate in agriculture is an efficient way to recycle materials and to decrease the use of mineral fertilizers. The agronomic characteristics of the digestates can promote plant growth and soil properties after digestate fertilization but also harmful effects can arise due to digestate quality, e.g. pH, organic matter and heavy metal content. The objective of this study was to evaluate the differences and similarities in agronomic characteristics and the value of five urban waste digestates from different biogas plants treating either food waste, organic fraction of organic solid waste or a mixture of waste-activated sludge and vegetable waste. The digestate agronomic characteristics were studied with chemical analyses and the availability of nutrients was also assessed with growth experiments and soil mineralization tests. All studied urban digestates produced 5-30% higher ryegrass yields compared to a control mineral fertilizer with a similar inorganic nitrogen concentration, while the feedstock source affected the agronomic value. Food waste and organic fraction of municipal solid waste digestates were characterized by high agronomic value due to the availability of nutrients and low heavy metal load. Waste-activated sludge as part of the feedstock mixture, however, increased the heavy metal content and reduced nitrogen availability to the plant, thus reducing the fertilizer value of the digestate.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Chemistry and Bioengineering, Research group: Industrial Bioengineering and Applied Organic Chemistry, Natural Resources Institute Finland (Luke)

Contributors: Tampio, E., Salo, T., Rintala, J.

Number of pages: 10

Pages: 293-302

Publication date: 15 Mar 2016

Peer-reviewed: Yes

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Volume: 169

ISSN (Print): 0301-4797

Ratings:

Scopus rating (2016): CiteScore 5.9 SJR 1.161 SNIP 1.833

Original language: English

ASJC Scopus subject areas: Environmental Engineering, Waste Management and Disposal, Management, Monitoring, Policy and Law

Keywords: Anaerobic digestion, Digestate, Fertilizer value, Heavy metals, Nutrients, Plant growth

DOIs:

10.1016/j.jenvman.2016.01.001

Source: Scopus

Source ID: 84954489661

Research output: Contribution to journal › Article › Scientific › peer-review

### **From the front end of projects to the back end of operations: Managing projects for value creation throughout the system lifecycle**

Morris (2013) calls for value creation for project stakeholders using project outcomes. This is an attempt to link the front end of the system lifecycle - the project phase - to the back end, i.e. the operations phase. Little is however known about how value creation occurs through developing project outcomes which have the capacity to continue value-creating

activities even decades after a project is completed. We establish that projects are multi-organizational systems which transit from the project phase to the operations phase in system lifecycles, and we use the systems view to analyze value creation mechanisms within the system lifecycle. We carry out empirical research into the lifecycle of a shopping center. Four distinct value-enhancing integration mechanisms in the operations of this multi-organizational system are identified, and propositions for four new project management approaches that create value during the project and have long-term value-enhancing impacts in the operations phase are derived.

#### **General information**

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Aalto University  
Contributors: Artto, K., Ahola, T., Vartiainen, V.  
Number of pages: 13  
Pages: 258-270  
Publication date: 1 Feb 2016  
Peer-reviewed: Yes

#### **Publication information**

Journal: International Journal of Project Management  
Volume: 34  
Issue number: 2  
ISSN (Print): 0263-7863  
Ratings:  
Scopus rating (2016): CiteScore 7.3 SJR 1.434 SNIP 2.872  
Original language: English  
ASJC Scopus subject areas: Business and International Management, Management, Monitoring, Policy and Law, Management of Technology and Innovation  
Keywords: Integration, Management of projects, Operations phase, Project phase, System lifecycle, Value creation  
DOIs:  
10.1016/j.ijproman.2015.05.003  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84952862255&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84952862255  
Research output: Contribution to journal › Article › Scientific › peer-review

#### **Clashing coalitions: A discourse analysis of an artificial groundwater recharge project in Finland**

The purpose of this paper is to increase understanding of the dynamics of knowledge production in the context of large-scale environmental projects causing local conflict. In particular, the paper analyses the discourse coalitions that formed around an artificial groundwater recharge project for the Turku Region in Finland. The material for this study consists of over 400 articles and opinion pieces which were collected from local and regional newspapers between 1999 and 2010. The articles were analysed by using Hajer's [1995. The politics of environmental discourse. Ecological modernisation and the policy process. Oxford, UK: Clarendon] discursive framework, and the analysis was complemented with the concept of knowledge coalition by Van Buuren and Edelenbos [2004. Conflicting knowledge. Why is joint knowledge production such a problem? Science and Public Policy, 31 (4), 289–299]. Results of the study indicate that knowledge coalitions were formed among the researchers, lay residents, and policy-makers, and they all utilised similar expertise-based factual arguments to support their cause. Thus, the paper participates in the academic discussion on the use and interpretation of expert knowledge in environmental policy-making by reshaping the division between experts and lay residents.

#### **General information**

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Department of Chemistry and Bioengineering, Research group: Industrial Bioengineering and Applied Organic Chemistry, Turun Kauppakorkeakoulu  
Contributors: Kurki, V., Takala, A., Vinnari, E.  
Pages: 1317-1331  
Publication date: 2016  
Peer-reviewed: Yes

#### **Publication information**

Journal: Local Environment  
Volume: 21  
Issue number: 11  
ISSN (Print): 1354-9839  
Ratings:

Scopus rating (2016): CiteScore 3.2 SJR 0.852 SNIP 0.941

Original language: English

ASJC Scopus subject areas: Geography, Planning and Development, Management, Monitoring, Policy and Law

Keywords: civil society, Environmental conflict, infrastructure projects, knowledge production, local government

DOIs:

10.1080/13549839.2015.1113516

URLs:

<http://www.scopus.com/inward/record.url?scp=84946605654&partnerID=8YFLogxK> (Link to publication in Scopus)

#### **Bibliographical note**

EXT="Vinnari, Eija"

Source: Scopus

Source ID: 84946605654

Research output: Contribution to journal > Article > Scientific > peer-review

#### **Metabolic engineering of *Acinetobacter baylyi* ADP1 for removal of *Clostridium butyricum* growth inhibitors produced from lignocellulosic hydrolysates**

Background: Pretreatment of lignocellulosic biomass can produce inhibitory compounds that are harmful for microorganisms used in the production of biofuels and other chemicals from lignocellulosic sugars. Selective inhibitor removal can be achieved with biodegradation where microorganisms catabolize the inhibitors without consuming the sugars. We engineered the strictly aerobic *Acinetobacter baylyi* ADP1 for detoxification of lignocellulosic hydrolysates by removing the gene for glucose dehydrogenase, *gcd*, which catalyzes the first step in its glucose catabolism. Results: The engineered *A. baylyi* ADP1 strain was shown to be incapable of consuming the main sugar components of lignocellulosic hydrolysates, i.e., glucose, xylose, and arabinose, but rapidly utilized acetate and formate. Formate was consumed during growth on acetate and by stationary phase cells, and this was enhanced in the presence of a common aromatic inhibitor of lignocellulosic hydrolysates, 4-hydroxybenzoate. The engineered strain tolerated glucose well up to 70 g/l, and the consumption of glucose, xylose, or arabinose was not observed in prolonged cultivations. The engineered strain was applied in removal of oxygen, a gaseous inhibitor of anaerobic fermentations. Co-cultivation with the *A. baylyi* ADP1 *gcd* knockout strain under initially aerobic conditions allowed the strictly anaerobic *Clostridium butyricum* to grow and produce hydrogen ( $H_2$ ) from sugars of the enzymatic rice straw hydrolysate. Conclusions: We demonstrated that the model organism of bacterial genetics and metabolism, *A. baylyi* ADP1, could be engineered to be an efficient biodegradation strain of lignocellulosic hydrolysates. Only one gene knockout was required to completely eliminate sugar consumption and the strain could be used in production of anaerobic conditions for the strictly anaerobic hydrogen producer, *C. butyricum*. Because of these encouraging results, we believe that *A. baylyi* ADP1 is a promising candidate for the detoxification of lignocellulosic hydrolysates for bioprocesses.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Chemistry and Bioengineering, Research group: Industrial Bioengineering and Applied Organic Chemistry, Urban circular bioeconomy (UrCirBio), Rhodes University

Contributors: Kannisto, M. S., Mangayil, R. K., Shrivastava-Bhattacharya, A., Pletschke, B. I., Karp, M. T., Santala, V. P.

Publication date: 1 Dec 2015

Peer-reviewed: Yes

#### **Publication information**

Journal: *Biotechnology for Biofuels*

Volume: 8

Issue number: 1

Article number: 198

ISSN (Print): 1754-6834

Ratings:

Scopus rating (2015): CiteScore 8.8 SJR 2.487 SNIP 1.993

Original language: English

ASJC Scopus subject areas: Energy(all), Management, Monitoring, Policy and Law, Biotechnology, Applied Microbiology and Biotechnology, Renewable Energy, Sustainability and the Environment

Keywords: *Acinetobacter baylyi*, Biodegradation, Biohydrogen, *Clostridium butyricum*, Metabolic engineering, Rice straw hydrolysate

DOIs:

10.1186/s13068-015-0389-6

Source: Scopus

Source ID: 84956930091

Research output: Contribution to journal > Article > Scientific > peer-review

### Testing the near field/far field model performance for prediction of particulate matter emissions in a paint factory

A Near Field/Far Field (NF/FF) model is a well-accepted tool for precautionary exposure assessment but its capability to estimate particulate matter (PM) concentrations is not well studied. The main concern is related to emission source characterization which is not as well defined for PM emitters compared to e.g. for solvents. One way to characterize PM emission source strength is by using the material dustiness index which is scaled to correspond to industrial use by using modifying factors, such as handling energy factors. In this study we investigate how well the NF/FF model predicts PM concentration levels in a paint factory. PM concentration levels were measured during big bag and small bag powder pouring. Rotating drum dustiness indices were determined for the specific powders used and applied in the NF/FF model to predict mass concentrations. Modeled process specific concentration levels were adjusted to be similar to the measured concentration levels by adjusting the handling energy factor. The handling energy factors were found to vary considerably depending on the material and process even though they have the same values as modifying factors in the exposure models. This suggests that the PM source characteristics and process-specific handling energies should be studied in more detail to improve the model-based exposure assessment.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Physics, Danmarks Tekniske Universitet, DTU Informatik, Denmark Technical University DTU, National Research Centre for the Working Environment, Department of Micro and Nanotechnology

Contributors: Koivisto, A. J., Jensen, A. C. Ø., Levin, M., Kling, K. I., Maso, M. D., Nielsen, S. H., Jensen, K. A., Koponen, I. K.

Number of pages: 12

Pages: 62-73

Publication date: 1 Jan 2015

Peer-reviewed: Yes

#### Publication information

Journal: Environmental Sciences: Processes and Impacts

Volume: 17

Issue number: 1

ISSN (Print): 2050-7887

Ratings:

Scopus rating (2015): CiteScore 4.3 SJR 0.998 SNIP 0.923

Original language: English

ASJC Scopus subject areas: Environmental Chemistry, Public Health, Environmental and Occupational Health, Management, Monitoring, Policy and Law, Medicine(all)

DOIs:

10.1039/c4em00532e

URLs:

<http://www.scopus.com/inward/record.url?scp=84920000979&partnerID=8YFLogxK> (Link to publication in Scopus)

#### Bibliographical note

EXT="Koivisto, A. J."

Source: Scopus

Source ID: 84920000979

Research output: Contribution to journal › Article › Scientific › peer-review

### Groundwater as a source of conflict and cooperation: Towards creating mutual gains in a Finnish water supply project

Community planners, decision-makers and authorities frequently encounter conflicts revolving around natural resource management as well as around urban planning. Since the 1970s, the dynamics of conflict resolution have evolved from conventional expert-based rational solutions towards collaborative ones. Against this background, our research investigates one contentious groundwater project in the Tampere Region in Finland. Conflict assessment clarified the divergent interests of the multiple parties. Drawing on negotiation theory, this study illustrates how polarised positions and competitive framing, as well as the influence of historical baggage, may form an insurmountable barrier to successful negotiation. While the acknowledgement of various interests should form the heart of the integrative negotiation process, excessive energy is used for argumentation to protect predefined goals with as minor concessions as possible. Addressing the collaborative approach, we suggest multiple ways towards creating mutual gains and cooperation in future water supply projects.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Chemistry and Bioengineering, Research group: Industrial Bioengineering and Applied Organic Chemistry, Life Cycle Effectiveness of the Built Environment (LCE@BE)

Contributors: Kurki, V., Katko, T. S.  
Number of pages: 15  
Pages: 337-351  
Publication date: 2015  
Peer-reviewed: Yes

#### Publication information

Journal: Water Alternatives  
Volume: 8  
Issue number: 3  
ISSN (Print): 1965-0175  
Ratings:

Scopus rating (2015): CiteScore 4.5 SJR 0.899 SNIP 1.402

Original language: English

ASJC Scopus subject areas: Management, Monitoring, Policy and Law, Geography, Planning and Development, Political Science and International Relations

Keywords: Case-study, Conflict assessment, Finland, Groundwater, Integrative negotiation, Mutual gains approach

URLs:

<http://www.water-alternatives.org/index.php/alldoc/articles/vol8/v8issue3/295-a8-3-3>

URLs:

<http://www.scopus.com/inward/record.url?scp=84948137804&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84948137804

Research output: Contribution to journal › Article › Scientific › peer-review

#### Institutional entrepreneurship, power, and knowledge in innovation systems: Institutionalization of regenerative medicine in Tampere, Finland

In this paper we ask what is the place of institutional entrepreneurship in a (regional) innovation system. The main research questions addressed are (a) how does a new science-based concentration of innovation become institutionalized in an innovation system; (b) who are the institutional entrepreneurs and what do they actually do in their efforts to institutionalize new beliefs, practices, and activities within a system; and (c) what knowledge do institutional entrepreneurs need and what kind of power do they exercise in the institutionalization process. We add new knowledge to studies focusing on innovation systems by revealing how new elements are attached into it. We also add power and knowledge to the study of institutional entrepreneurship and institutional change. The empirical analysis identifies the main phases of institutionalization, key actors in different phases, and their strategies of influence. This paper is based on the analysis of secondary data and twenty-eight interviews with key actors.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Institute of Society and Space (SOCIS)

Contributors: Sotarauta, M., Mustikkamäki, N.

Number of pages: 16

Pages: 342-357

Publication date: 2015

Peer-reviewed: Yes

#### Publication information

Journal: ENVIRONMENT AND PLANNING C: GOVERNMENT AND POLICY

Volume: 33

Issue number: 2

ISSN (Print): 0263-774X

Ratings:

Scopus rating (2015): CiteScore 4.1 SJR 1.479 SNIP 1.591

Original language: English

ASJC Scopus subject areas: Environmental Science (miscellaneous), Public Administration, Management, Monitoring, Policy and Law, Geography, Planning and Development

Keywords: Innovation system, Institution, Institutional entrepreneurship, Knowledge, Power, Regenerative medicine

DOIs:

10.1068/c12297r

URLs:

<http://www.scopus.com/inward/record.url?scp=84926362021&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84926362021

### What is project governance and what are its origins?

Although there is an ever-increasing discussion on governance in recent project research, the concept of project governance and its main origins remains ambiguous. In this paper, we examine project governance literature and contrast it to general governance literature published outside the domain of project research. Our analysis revealed the existence of two distinct and relatively independent streams of research. One of these streams addresses project governance as a phenomenon external to any specific project, while the other views project governance as internal to a specific project. Our results further indicate that while project governance literature bases most of its argumentation on established project research it also, to a significant extent, draws from the transaction cost economics literature. Based on our findings, we argue that there exists considerable potential for bridging project governance literature and general governance literature further.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Managing digital industrial transformation (mDIT), School of Science, Aalto University, Univ of Oulu

Contributors: Ahola, T., Ruuska, I., Artto, K., Kujala, J.

Number of pages: 12

Pages: 1321-1332

Publication date: 1 Nov 2014

Peer-reviewed: Yes

#### Publication information

Journal: International Journal of Project Management

Volume: 32

Issue number: 8

ISSN (Print): 0263-7863

Ratings:

Scopus rating (2014): CiteScore 5.2 SJR 1.411 SNIP 2.893

Original language: English

ASJC Scopus subject areas: Business and International Management, Management of Technology and Innovation, Management, Monitoring, Policy and Law

Keywords: Governance, Literature analysis, Project governance

DOIs:

10.1016/j.ijproman.2013.09.005

URLs:

<http://www.scopus.com/inward/record.url?scp=84908052013&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84908052013

Research output: Contribution to journal › Article › Scientific › peer-review

### In-use vs. type-approval fuel consumption of current passenger cars in Europe

In-use fuel consumption data of 924 passenger cars (611 petrol, 313 diesel) were collected from various European sources and were evaluated in comparison to their corresponding type-approval values. The analysis indicated that the average in-use fuel consumption was higher than the type-approval one by 11% for petrol cars and 16% for diesel cars. Comparison of this dataset with the Travelcard database in the Netherlands showed that the deviation increased for late model years and in particular for cars with low type-approval values. The deviation was higher than 60% for vehicles registered in 2012 within the 90-100gCO<sub>2</sub>/km bin. Unrealistic vehicle resistances used in type-approval were identified as one of the prime reasons of the difference. A simplified linear model developed in the study may be used to predict in-use fuel consumption based on data publicly available. The model utilizes the fuel consumption measured in type-approval, the mass, and the engine capacity to provide in-use fuel consumption. This may be either used to correct fuel consumption factors currently utilized by emission models (e.g. COPERT, HBEFA, VERSIT+, and others) or could be used independently to make projections on how fuel consumption may develop on the basis of changing future passenger cars characteristics.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Urban circular bioeconomy (UrCirBio), Laboratory of Applied Thermodynamics, Aristotle University of Thessaloniki, EMISIA SA, INFRAS, Graz University of Technology, TNO, STL Group, European Commission-JRC

Contributors: Ntziachristos, L., Mellios, G., Tsokolis, D., Keller, M., Hausberger, S., Ligterink, N. E., Dilara, P.

Number of pages: 9

Pages: 403-411

Publication date: Apr 2014

Peer-reviewed: Yes

### Publication information

Journal: Energy Policy

Volume: 67

ISSN (Print): 0301-4215

Ratings:

Scopus rating (2014): CiteScore 6 SJR 2.143 SNIP 1.892

Original language: English

ASJC Scopus subject areas: Energy(all), Management, Monitoring, Policy and Law

Keywords: Fuel economy, Greenhouse gases, Road transport

DOIs:

10.1016/j.enpol.2013.12.013

URLs:

<http://www.scopus.com/inward/record.url?scp=84893819422&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84893819422

Research output: Contribution to journal > Article > Scientific > peer-review

### Project-based and temporary organizing: Reconnecting and rediscovering

In recent years, the linkages between project management and organization theory have become stronger. In an attempt to address this development, this paper analyzes the research on temporary and project-based organizing. It especially discusses the development associated with the EGOS sub-themes on project organizing and the potential avenues for future research. The paper also summarizes the key findings from the included papers in the special issue on project-based and temporary organizing, which is based on papers from the EGOS conference in 2013. One key argument is that project organizing needs to develop along three lines: new empirical contexts, new theoretical/conceptual issues, and new research methodologies.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: BI Norwegian Business School, University of Quebec at Montreal (UQAM), Aalto University

Contributors: Söderlund, J., Hobbs, B., Ahola, T.

Number of pages: 6

Pages: 1085-1090

Publication date: 2014

Peer-reviewed: Yes

### Publication information

Journal: International Journal of Project Management

Volume: 32

Issue number: 7

ISSN (Print): 0263-7863

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ASJC Scopus subject areas: Business and International Management, Management, Monitoring, Policy and Law, Management of Technology and Innovation

DOIs:

10.1016/j.ijproman.2014.06.008

URLs:

<http://www.scopus.com/inward/record.url?scp=84940229964&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84940229964

Research output: Contribution to journal > Editorial > Scientific > peer-review

### Attitude-behaviour gap in energy issues: Case study of three different Finnish residential areas

To mitigate climate change technical advances must be accompanied by greater ecological commitment from consumers, i.e. households. This study aims to determine whether there are differences in energy attitudes and energy behaviour between residents living in three different types of residential districts. To gain an understanding of attitudes, the study investigated the participants' concerns about climate change, their position on energy issues and their perceptions of their own energy behaviour. To gain an understanding of actual energy behaviour the study investigated the participants' carbon footprints. The results indicate that there is a gap between people's energy attitudes and their actual energy

behaviour. There seems to be a discernible 'ecologisation', a greening of attitudes, in Finnish society, but actual energy behaviour is changing more slowly. People know how to reduce their energy use but are e.g. too comfort-loving or indifferent to make any changes to their energy use. Due to the attitudes are not becoming more environment friendly and no environmental action is happening. Regarding further research this gap need to be investigated specifically and filled because it could otherwise prove a significant stumbling block to achieving the desired rate of progress towards the country's environmental goals.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Life Cycle Effectiveness of the Built Environment (LCE@BE), Aalto University, School of Engineering, Aalto University

Contributors: Valkila, N., Saari, A.

Number of pages: 11

Pages: 24-34

Publication date: Feb 2013

Peer-reviewed: Yes

#### **Publication information**

Journal: ENERGY FOR SUSTAINABLE DEVELOPMENT

Volume: 17

Issue number: 1

ISSN (Print): 0973-0826

Ratings:

Scopus rating (2013): CiteScore 4.2 SJR 1.651 SNIP 2.045

Original language: English

ASJC Scopus subject areas: Renewable Energy, Sustainability and the Environment, Geography, Planning and Development, Management, Monitoring, Policy and Law

Keywords: Carbon footprint, Energy attitudes, Energy behaviour, Finland, Greenhouse gas emissions

DOIs:

10.1016/j.esd.2012.10.001

URLs:

<http://www.scopus.com/inward/record.url?scp=84871966946&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84871966946

Research output: Contribution to journal > Article > Scientific > peer-review

#### **Constructing the market position of a project-based firm**

Project marketing research has shown that project-based firms (PBFs) can favorably differentiate themselves from their competitors by developing a strong functional position and a strong relational position in a specific market milieu. Combined, these two interrelated positions constitute the market position of a project-based firm, and inter-organizational relationships (IORs) between a PBF and other actors in the milieu play an important role in its development. Active development of IORs to key actors simultaneously increases the effectiveness of the focal PBF in delivering solutions to its customers (functional position) and simultaneously enables it to occupy a stronger position in the milieu linking it to its customers (relational position). We present evidence from an empirical case focusing on how an automation system supplier gradually constructed a strong market position in the Russian oil and gas industry.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Managing digital industrial transformation (mDIT), School of Science, Aalto University, Univ of Oulu, Metso Automation

Contributors: Ahola, T., Kujala, J., Laaksonen, T., Aaltonen, K.

Number of pages: 11

Pages: 355-365

Publication date: 2013

Peer-reviewed: Yes

#### **Publication information**

Journal: International Journal of Project Management

Volume: 31

Issue number: 3

ISSN (Print): 0263-7863

Ratings:

Scopus rating (2013): CiteScore 4.9 SJR 1.226 SNIP 2.737

Original language: English

ASJC Scopus subject areas: Business and International Management, Management, Monitoring, Policy and Law, Management of Technology and Innovation

Keywords: Functional position, Inter-organizational relationship, Market position, Project marketing, Relational position  
DOIs:

10.1016/j.ijproman.2012.09.008

URLs:

<http://www.scopus.com/inward/record.url?scp=84874295380&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84874295380

Research output: Contribution to journal › Article › Scientific › peer-review

### **Use of services to support the business of a project-based firm**

Project-based firms that have traditionally focused on product-centric project deliveries as their core business are increasingly complementing their deliveries with different types of service offerings to create customer specific solutions. Such deliveries frequently encompass the design and delivery of a fully operational system with additional components such as maintenance and optimization of system during its life cycle. From the perspective of customer value, solution deliveries can be divided in to three elements: core project delivery, facilitating service products that are mandatory for use of the core project delivery and supporting service products that create additional value for the customer. In this paper we aim to increase the understanding on the impact of the addition of different types of services such as consultation, conceptual design, feasibility studies, training, maintenance, operation support, and production optimization may have on the business of a project-based firm. We analyze their contribution from five distinct perspectives: strategic, marketing and sales, project implementation, learning and innovation and financial. We carried out an empirical multi-case study within three large-sized project-based firms representing different industries. The results indicate that services play a versatile role in supporting the business of project-based firms - a role which goes beyond simply ensuring the short term profitability of the firm. Furthermore, delivering a specific service, such as consultation or process optimization, may often contribute favorably to more than one of the five perspectives analyzed in this study.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Managing digital industrial transformation (mDIT), Univ of Oulu, School of Science, Aalto University

Contributors: Kujala, J., Ahola, T., Huikuri, S.

Number of pages: 13

Pages: 177-189

Publication date: 2013

Peer-reviewed: Yes

### **Publication information**

Journal: International Journal of Project Management

Volume: 31

Issue number: 2

ISSN (Print): 0263-7863

Ratings:

Scopus rating (2013): CiteScore 4.9 SJR 1.226 SNIP 2.737

Original language: English

ASJC Scopus subject areas: Business and International Management, Management, Monitoring, Policy and Law, Management of Technology and Innovation

Keywords: Project, Project business, Project life cycle, Project-based firm, Service dominant logic, Services

DOIs:

10.1016/j.ijproman.2012.07.007

URLs:

<http://www.scopus.com/inward/record.url?scp=84870752983&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84870752983

Research output: Contribution to journal › Article › Scientific › peer-review

### **The Policy Relevance of Wear Emissions from Road Transport, Now and in the Future-An International Workshop Report and Consensus Statement**

Road transport emissions are a major contributor to ambient particulate matter concentrations and have been associated with adverse health effects. Therefore, these emissions are targeted through increasingly stringent European emission standards. These policies succeed in reducing exhaust emissions, but do not address "nonexhaust" emissions from brake wear, tire wear, road wear, and suspension in air of road dust. Is this a problem? To what extent do nonexhaust emissions contribute to ambient concentrations of PM<sub>10</sub> or PM<sub>2.5</sub>? In the near future, wear emissions may dominate the remaining traffic-related PM<sub>10</sub> emissions in Europe, mostly due to the steep decrease in PM exhaust emissions. This underlines the

need to determine the relevance of the wear emissions as a contribution to the existing ambient PM concentrations, and the need to assess the health risks related to wear particles, which has not yet received much attention. During a workshop in 2011, available knowledge was reported and evaluated so as to draw conclusions on the relevance of traffic-related wear emissions for air quality policy development. On the basis of available evidence, which is briefly presented in this paper, it was concluded that nonexhaust emissions and in particular suspension in air of road dust are major contributors to exceedances at street locations of the PM<sub>10</sub> air quality standards in various European cities. Furthermore, wear-related PM emissions that contain high concentrations of metals may (despite their limited contribution to the mass of nonexhaust emissions) cause significant health risks for the population, especially those living near intensely trafficked locations. To quantify the existing health risks, targeted research is required on wear emissions, their dispersion in urban areas, population exposure, and its effects on health. Such information will be crucial for environmental policymakers as an input for discussions on the need to develop control strategies. Road transport particulate matter (PM) emissions are associated with adverse health effects. Stringent policies succeed in reducing the exhaust PM emissions, but do not address "nonexhaust" emissions from brake wear, tire wear, road wear, and suspension in air of road dust. In the near future the nonexhaust emissions will dominate the road transport PM emissions. Based on the limited available evidence, it is argued that dedicated research is required on nonexhaust emissions and dispersion to urban areas from both an air quality and a public health perspective. The implicated message to regulators and policy makers is that road transport emissions continue to be an issue for health and air quality, despite the encouraging rapid decrease of tailpipe exhaust emissions. Supplemental Materials: Supplemental materials are available for this paper. Go to the publisher's online edition of the Journal of the Air & Waste Management Association.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Urban circular bioeconomy (UrCirBio), TNO, STL Group, National Institute for Public Health and the Environment, Swiss Federal Laboratories for Materials Science and Technology, Swedish National Road and Transport Research Institute, King Abdulaziz University, Environment and Health Administration, Ministry of Infrastructure and Environment Directorate Climate and Air Quality, Laboratory of Applied Thermodynamics, Aristotle University of Thessaloniki, Institute for Work and Health, Institute for Risk Assessment Sciences

Contributors: Denier van der Gon, H. A. C., Gerlofs-Nijland, M. E., Gehrig, R., Gustafsson, M., Janssen, N., Harrison, R. M., Hulskotte, J., Johansson, C., Jozwicka, M., Keuken, M., Krijghsheld, K., Ntziachristos, L., Riediker, M., Cassee, F. R.

Number of pages: 14

Pages: 136-149

Publication date: 2013

Peer-reviewed: Yes

### Publication information

Journal: Journal of the Air and Waste Management Association

Volume: 63

Issue number: 2

ISSN (Print): 1096-2247

Ratings:

Scopus rating (2013): CiteScore 2.5 SJR 0.643 SNIP 0.871

Original language: English

ASJC Scopus subject areas: Management, Monitoring, Policy and Law, Waste Management and Disposal, Medicine(all)

DOIs:

10.1080/10962247.2012.741055

URLs:

<http://www.scopus.com/inward/record.url?scp=84873190637&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84873190637

Research output: Contribution to journal > Article > Scientific > peer-review

### Consumer panel on the readiness of finns to behave in a more pro-environmental manner

Due to climate change, there is an urgent need to take measures toward reducing greenhouse gases and energy consumption. It is therefore vital to examine peoples' attitudes and the potential for a more pro-environmental readiness. Consumer panels were used in the gathering of data, even with such small subsamples, statistical significance of difference cannot be assessed. The research subjects participating were randomly selected from two different residential areas and three different age groups. The consumer panels examined the environmental attitudes of the research subjects as well as their readiness to adopt a more pro-environmental lifestyle under four theme headings: Urban structure, household energy consumption, mobility and lifestyle. The results suggest that all the research subjects are very much ready to reduce their consumption, but not quite ready to invest in expensive, but environmentally-friendly equipment. Young and elderly research subjects seemed more prepared to make pro-environmental changes than middle-aged subjects. Place of residence also seemed to have an impact on the adoption threshold: Research subjects living in more densely populated suburbs seemed to be more willing to give up driving, whereas those living in sparsely populated areas seemed to be more willing to invest in expensive, but environmentally-friendly equipment and give up flying for vacations.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Life Cycle Effectiveness of the Built Environment (LCE@BE), Aalto Univ, Aalto University, Sch Engrn, Dept Civil & Struct Engrn

Contributors: Valkila, N., Saari, A.

Number of pages: 19

Pages: 1561-1579

Publication date: Jul 2012

Peer-reviewed: Yes

### Publication information

Journal: Sustainability

Volume: 4

Issue number: 7

ISSN (Print): 2071-1050

Ratings:

Scopus rating (2012): CiteScore 1.4 SJR 0.463 SNIP 0.774

Original language: English

ASJC Scopus subject areas: Management, Monitoring, Policy and Law, Renewable Energy, Sustainability and the Environment, Geography, Planning and Development

Keywords: consumer panel, environmental-friendliness, behavioral readiness, urban structure, sustainable consumption, GREENHOUSE-GAS EMISSIONS, ENERGY

DOIs:

10.3390/su4071561

URLs:

<http://www.scopus.com/inward/record.url?scp=84864474855&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84864474855

Research output: Contribution to journal > Article > Scientific > peer-review

### Policy learning and the 'cluster-flavoured innovation policy' in Finland

With this paper I aim to shed light on the attempts that have been made to adjust Finnish policy making to the changes in the global technoeconomic environment, as well as to the meta-rationales behind the evolving cluster-flavoured innovation (CFI) policies. Policy learning is discussed with reference to the main cluster and innovation policy changes in Finland and related conceptual development. My main aim is to paint an overall picture of Finnish CFI policies and learning related to them as well as to analyse how efforts to redesign the policies have been unfolding over the past twenty years. This paper is based on (a) secondary data (ie, earlier studies and reports on the Finnish cluster and innovation policies) and (b) data from two empirical studies.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Institute of Society and Space (SOCIS)

Contributors: Sotarauta, M.

Number of pages: 16

Pages: 780-795

Publication date: 2012

Peer-reviewed: Yes

### Publication information

Journal: ENVIRONMENT AND PLANNING C: GOVERNMENT AND POLICY

Volume: 30

Issue number: 5

ISSN (Print): 0263-774X

Ratings:

Scopus rating (2012): CiteScore 2.6 SJR 0.869 SNIP 1.007

Original language: English

ASJC Scopus subject areas: Environmental Science (miscellaneous), Public Administration, Management, Monitoring, Policy and Law, Geography, Planning and Development

Keywords: Cluster policy, Finland, Governance, Innovation policy, Policy learning

DOIs:

10.1068/c1191

URLs:

<http://www.scopus.com/inward/record.url?scp=84868023229&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84868023229

Research output: Contribution to journal › Article › Scientific › peer-review

### **A new governance approach for multi-firm projects: Lessons from Olkiluoto 3 and Flamanville 3 nuclear power plant projects**

We analyze governance in two contemporary nuclear power plant projects: Olkiluoto 3 (Finland) and Flamanville 3 (France). We suggest that in the governance of large multi-firm projects, any of the prevalent governance approaches that rely on market, hierarchy, or hybrid forms, is not adequate as such. This paper opens up avenues towards a novel theory of governance in large projects by adopting a project network view with multiple networked firms within a single project, and by simultaneously going beyond organizational forms that cut across the traditional firm-market dichotomy. Our analysis suggests four changes in the prevailing perspective towards the governance of large projects. First, there should be a shift from viewing multi-firm projects as hierarchical contract organizations to viewing them as supply networks characterized by a complex and networked organizational structure. Second, there should be a shift in the emphasis of the predominant modes of governance, market and hierarchy towards novel governance approaches that emphasize network-level mechanisms such as self-regulation within the project. Third, there should be a shift from viewing projects as temporary endeavors to viewing projects as short-term events or episodes embedded in the long-term sphere of shared history and expected future activities among the involved actors. Fourth, there should be a shift from the prevailing narrow view of a hierarchical project management system towards an open system view of managing in complex and challenging institutional environments.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Managing digital industrial transformation (mDIT), Aalto University, BIT Research Centre, Politecnico di Milano

Contributors: Ruuska, I., Ahola, T., Artto, K., Locatelli, G., Mancini, M.

Number of pages: 14

Pages: 647-660

Publication date: Aug 2011

Peer-reviewed: Yes

#### **Publication information**

Journal: International Journal of Project Management

Volume: 29

Issue number: 6

ISSN (Print): 0263-7863

Ratings:

Scopus rating (2011): CiteScore 3.9 SJR 1.035 SNIP 2.29

Original language: English

ASJC Scopus subject areas: Business and International Management, Management, Monitoring, Policy and Law, Management of Technology and Innovation

Keywords: Flamanville 3, Governance, Large project, Multi-firm project, Nuclear power plant project, Olkiluoto 3, Project network

DOIs:

10.1016/j.ijproman.2010.10.001

URLs:

<http://www.scopus.com/inward/record.url?scp=79960054401&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 79960054401

Research output: Contribution to journal › Article › Scientific › peer-review

### **Institutional entrepreneurship for knowledge regions: In search of a fresh set of questions for regional innovation studies**

We investigate conceptually the institutional change process and innovation underpinning knowledge-based regional development from the point of view of institutional entrepreneurship. The main aim is to raise institutional entrepreneurship among debated concepts in regional development studies. We set out to discuss the following question: what kind of conceptual base provides empirical studies with a fresh set of research questions and hence point of departure in a study of the ways in which actors influence the course of events and aim to change the very institutional setting in which they are embedded.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Institute of Society and Space (SOCIS)  
Contributors: Sotarauta, M., Pulkkinen, R.  
Number of pages: 17  
Pages: 96-112  
Publication date: 2011  
Peer-reviewed: Yes

#### Publication information

Journal: ENVIRONMENT AND PLANNING C: GOVERNMENT AND POLICY  
Volume: 29  
Issue number: 1  
ISSN (Print): 0263-774X  
Ratings:

Scopus rating (2011): CiteScore 2.5 SJR 0.991 SNIP 1.168

Original language: English

ASJC Scopus subject areas: Environmental Science (miscellaneous), Public Administration, Management, Monitoring, Policy and Law, Geography, Planning and Development

DOIs:

10.1068/c1066r

URLs:

<http://www.scopus.com/inward/record.url?scp=79952143814&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 79952143814

Research output: Contribution to journal › Article › Scientific › peer-review

#### Landfill gas upgrading with countercurrent water wash

A pilot-scale countercurrent absorption process for upgrading landfill gas to produce vehicle fuel was studied using absorption and desorption units and water as absorbent. The height-to-diameter ratio of the absorption column used was 3:1 instead of the more conventionally used 20:1 ratio, and a higher pressure was used along with a lower water flow rate. The effects of pressure (10-30 bar) and water and gas flow-ratios on the upgrading process were studied. Methane content in the product gas increased to near or above 90% with both gas flows (50 and 100 l/min) used at over 20 bar pressure with 10 l/min water flow and at 30 bar pressure with 5 l/min water flow. Carbon dioxide content with these upgrading parameters ranged from 3.2% to 4.8%. The remaining fraction of the product gas was nitrogen (from 6% to 7%), while hydrogen sulphide was removed to below the detection limit with all of the upgrading parameters used. The methane content of exhaust gas increased with increasing pressure. In conclusion, the pilot-scale gas upgrading process studied here appears to be able to produce gas with high energy content (>90% methane), apparently suitable as vehicle fuel, from landfill gas.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Jyväskylän yliopisto, University of Jyväskylä

Contributors: Rasi, S., Läntelä, J., Veijanen, A., Rintala, J.

Number of pages: 7

Pages: 1528-1534

Publication date: 2008

Peer-reviewed: Yes

#### Publication information

Journal: Waste Management

Volume: 28

Issue number: 9

ISSN (Print): 0956-053X

Ratings:

Scopus rating (2008): SJR 1.375 SNIP 2.162

Original language: English

ASJC Scopus subject areas: Geotechnical Engineering and Engineering Geology, Management, Monitoring, Policy and Law, Pollution, Waste Management and Disposal

DOIs:

10.1016/j.wasman.2007.03.032

Source: Scopus

Source ID: 45849134565

Research output: Contribution to journal › Article › Scientific › peer-review

### Detailed internal characterisation of two Finnish landfills by waste sampling

The aim of this study was to characterise the internal structure and composition of landfilled waste at two Finnish landfills to provide information for active and post-landfill operations. The two sites, Ämmässuo and Kujala, have been in operation for 17 and 48 years, respectively. Waste was sampled (total 68 samples) and analysed for total solids (TS), volatile solids (VS), total Kjeldahl nitrogen (TKN), biological methane potential (BMP) and leaching of organic material (determined as chemical oxygen demand, COD) and ammonium nitrogen ( $\text{NH}_4\text{-N}$ ). The results showed high vertical and horizontal variability, which indicated that both the waste composition and state of degradation varied greatly in both landfills. Ämmässuo was characterised by 2- to 4-fold higher BMP,  $\text{NH}_4\text{-N}$  and COD leaching than Kujala. Moreover, the ratio of VS to TS was higher at Ämmässuo, while TS content was lower. The highest mean BMPs (68 and 44  $\text{m}^3/\text{t}$  TS), TKN content (4.6 and 5.2  $\text{kg}/\text{t}$  dry weight) and VS/TS ratio (65% and 59%) were observed in the middle and top layers; and the lowest mean BMP (21 and 8  $\text{m}^3/\text{t}$  TS), TKN content (2.4  $\text{kg}/\text{t}$  dry weight, in both landfills) and VS/TS ratio (55% and 16% in Ämmässuo and Kujala, respectively) in the bottom layers. In conclusion, waste sampling is a feasible way of characterising the landfill body, despite the high variation observed and the fact that the minimum number and size of samples cannot easily be generalized to other landfills due to different methods of waste management and different landfilling histories.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Jyväskylän yliopisto, Matti Ettala Ltd., University of Jyväskylä

Contributors: Sormunen, K., Ettala, M., Rintala, J.

Number of pages: 13

Pages: 151-163

Publication date: 2008

Peer-reviewed: Yes

### Publication information

Journal: Waste Management

Volume: 28

Issue number: 1

ISSN (Print): 0956-053X

Ratings:

Scopus rating (2008): SJR 1.375 SNIP 2.162

Original language: English

ASJC Scopus subject areas: Geotechnical Engineering and Engineering Geology, Management, Monitoring, Policy and Law, Pollution, Waste Management and Disposal

DOIs:

10.1016/j.wasman.2007.01.003

Source: Scopus

Source ID: 35548944982

Research output: Contribution to journal > Article > Scientific > peer-review

### Mechanically-biologically treated municipal solid waste as a support medium for microbial methane oxidation to mitigate landfill greenhouse emissions

The residual fraction of mechanically-biologically treated municipal solid waste (MBT residual) was studied in the laboratory to evaluate its suitability and environmental compatibility as a support medium in methane ( $\text{CH}_4$ ) oxidative biocovers for the mitigation of greenhouse gas emissions from landfills. Two MBT residuals with 5 and 12 months total (aerobic) biological stabilisation times were used in the study. MBT residual appeared to be a favourable medium for  $\text{CH}_4$  oxidation as indicated by its area-based  $\text{CH}_4$  oxidation rates (12.2-82.3  $\text{g CH}_4 \text{ m}^{-2} \text{ d}^{-1}$  at 2-25 °C; determined in  $\text{CH}_4$ -sparged columns). The  $\text{CH}_4$  oxidation potential (determined in batch assays) of the MBT residuals increased during the 124 d column experiment, from <1.6 to a maximum of 104  $\mu\text{g CH}_4 \text{ g}_{\text{dw}}^{-1} \text{ h}^{-1}$  (dw = dry weight) at 5 °C and 578  $\mu\text{g CH}_4 \text{ g}_{\text{dw}}^{-1} \text{ h}^{-1}$  at 23 °C. Nitrous oxide ( $\text{N}_2\text{O}$ ) production in MBT residual (<15  $\mu\text{g N}_2\text{O kg}_{\text{dw}}^{-1} \text{ d}^{-1}$  in the  $\text{CH}_4$  oxidative columns) was at the lower end of the range of  $\text{N}_2\text{O}$  emissions reported for landfills and non-landfill soils, and insignificant as a greenhouse gas source. Also, anaerobic gas production (25.6  $\text{kg}_{\text{dw}}^{-1}$  during 217 d) in batch assays was low, indicating biological stability of the MBT residual. The electrical conductivities (140-250  $\text{mS m}^{-1}$ ), as well as the concentrations of zinc (3.0  $\text{mg l}^{-1}$ ), copper (0.5  $\text{mg l}^{-1}$ ), arsenic (0.3  $\text{mg l}^{-1}$ ), nickel (0.1  $\text{mg l}^{-1}$ ) and lead (0.1  $\text{mg l}^{-1}$ ) in MBT residual eluates from a leaching test (EN-12457-4) with a liquid/solid (L/S) ratio of 10:1, suggest a potential for leachate pollutant emissions which should be considered in plans to utilise MBT residual. In conclusion, the laboratory experiments suggest that MBT residual can be utilised as a support medium for  $\text{CH}_4$  oxidation, even at low temperatures, to mitigate greenhouse gas emissions from landfills.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed  
Organisations: Jyväskylän yliopisto, University of Jyväskylä  
Contributors: Einola, J. K. M., Karhu, A. E., Rintala, J. A.  
Number of pages: 15  
Pages: 97-111  
Publication date: 2008  
Peer-reviewed: Yes

#### Publication information

Journal: Waste Management  
Volume: 28  
Issue number: 1  
ISSN (Print): 0956-053X  
Ratings:

Scopus rating (2008): SJR 1.375 SNIP 2.162

Original language: English

ASJC Scopus subject areas: Geotechnical Engineering and Engineering Geology, Management, Monitoring, Policy and Law, Pollution, Waste Management and Disposal

DOIs:

10.1016/j.wasman.2007.01.002

Source: Scopus

Source ID: 35548991075

Research output: Contribution to journal > Article > Scientific > peer-review

#### Laboratory investigations on co-digestion of energy crops and crop residues with cow manure for methane production: Effect of crop to manure ratio

Anaerobic co-digestion of grass silage, sugar beet tops and oat straw with cow manure was evaluated in semi-continuously fed laboratory continuously stirred tank reactors (CSTRs). Co-digestion of manure and crops was shown to be feasible with feedstock volatile solids (VS) containing up to 40% of crops. The highest specific methane yields of 268, 229 and 213 l CH<sub>4</sub> kg<sup>-1</sup> VS<sub>added</sub> in co-digestion of cow manure with grass, sugar beet tops and straw, respectively, were obtained with 30% of crop in the feedstock, corresponding to 85-105% of the methane potential in the substrates as determined by batch assays. Including 30% of crop in the feedstock increased methane production per digester volume by 16-65% above that obtained from digestion of manure alone. Increasing the proportion of crops further to 40% decreased the specific methane yields by 4-12%, while doubling the loading rate from 2 to 4 kg VS m<sup>-3</sup> day<sup>-1</sup> decreased the specific methane yields by 16-26%. The post-methanation potential of the digestates corresponded to 0.9-2.5 m<sup>3</sup> CH<sub>4</sub> t<sup>-1</sup> wet weight of digestate and up to 12-31% of total methane production in northern climatic conditions, being highest after co-digestion of manure with straw.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Jyväskylän yliopisto, University of Jyväskylä

Contributors: Lehtomäki, A., Huttunen, S., Rintala, J. A.

Number of pages: 19

Pages: 591-609

Publication date: Sep 2007

Peer-reviewed: Yes

#### Publication information

Journal: Resources Conservation and Recycling

Volume: 51

Issue number: 3

ISSN (Print): 0921-3449

Ratings:

Scopus rating (2007): SJR 0.715 SNIP 1.676

Original language: English

ASJC Scopus subject areas: Renewable Energy, Sustainability and the Environment, Management, Monitoring, Policy and Law, Waste Management and Disposal, Economics and Econometrics

Keywords: Anaerobic digestion, Biogas, Co-digestion, Cow manure, Crop residues, CSTR, Energy crop digestion testing, Energy crops, Methane potential, Methane production

DOIs:

10.1016/j.resconrec.2006.11.004

Source: Scopus

Source ID: 34250321725

Research output: Contribution to journal > Article > Scientific > peer-review

### **Anaerobic co-digestion of potato tuber and its industrial by-products with pig manure**

The possible use of potato tuber and its industrial by-products (potato stillage and potato peels) on farm-scale co-digestion with pig manure was evaluated in a laboratory study. The methane yields ( $\text{m}^3 \text{kg}^{-1}$  volatile solids (VS) added waste) achieved on semi-continuous co-digestion at loading rate of  $2 \text{ kg VS m}^{-3} \text{ day}^{-1}$  in continuously stirred tank reactors at  $35^\circ\text{C}$  were 0.13-0.15 at 100:0 (VS% pig manure to VS% potato co-substrate), 0.21-0.24 at 85:15 and 0.30-0.33 at 80:20 feed ratio. Increasing the loading rate from 2 to  $3 \text{ kg VS m}^{-3} \text{ day}^{-1}$  at a feed VS ratio of 80:20 (pig manure to potato waste) produced methane yields of 0.28-0.30  $\text{m}^3 \text{kg}^{-1}$  VS added waste. Post-digestion (60 days) of the digested materials in batches produced 0.12-0.15  $\text{m}^3 \text{kg}^{-1}$  VS added waste of methane at  $35^\circ\text{C}$ . The results suggest that successful digester operation can be achieved with feed containing potato material up to 15-20% of the feed VS and that under similar feed VS, loading rate, retention time and feed VS ratio, the methane yields and process performance for potato tuber would be similar to that of its industrial residues. Thus, co-digestion of potatoes and/or its industrial by-products with manures on a farm-scale level would generate renewable energy and provide a means of waste treatment for industry.

#### **General information**

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Jyväskylän yliopisto, University of Jyväskylä  
Contributors: Kaparaju, P., Rintala, J.  
Number of pages: 14  
Pages: 175-188  
Publication date: Jan 2005  
Peer-reviewed: Yes

#### **Publication information**

Journal: Resources Conservation and Recycling  
Volume: 43  
Issue number: 2  
ISSN (Print): 0921-3449  
Ratings:  
Scopus rating (2005): SJR 0.725 SNIP 1.42  
Original language: English  
ASJC Scopus subject areas: Renewable Energy, Sustainability and the Environment, Management, Monitoring, Policy and Law, Waste Management and Disposal  
Keywords: Agro-industrial waste, Ammonia, Anaerobic digestion, Co-digestion, Methane, Pig manure, Potato peel, Potato stillage, Potato tuber  
DOIs:  
10.1016/j.resconrec.2004.06.001  
Source: Scopus  
Source ID: 7744243028  
Research output: Contribution to journal > Article > Scientific > peer-review

### **Removal of bis (2-ethylhexyl) phthalate from reject water in a nitrogen-removing sequencing batch reactor**

Reject water from sewage sludge processing may contain high concentrations of nutrients and organic pollutants and cause internal pollution load at a sewage treatment plant (STP) if circulated to the headworks of an STP. In the present study removal of nitrogen and bis (2-ethylhexyl) phthalate (DEHP) from reject water was studied in two sequencing batch reactors (SBRs) with different aerobic/anoxic periods during a 6-h total cycle period. Ammonia-nitrogen ( $\text{NH}_4\text{-N}$ ) was almost totally removed in both reactors, apparently by nitrification throughout the run, while denitrification declined with decreasing SCOD in the influent resulting in an increase in the effluent nitrate-nitrogen ( $\text{NO}_3\text{-N}$ ) concentration. DEHP removals from the water phases were above 95% in both reactors, while the average total removals were 36 and 42%, calculated on a mass basis. Much higher removals occurred in the experiment where one of the systems was spiked with a given amount of DEHP. The spiking experiment suggested that SBRs had the potential to remove DEHP biologically from reject water but that the removal was restricted by the poor bioavailability of DEHP as a result of sorption to solids. This study showed that SBR has the potential to cut the internal load of nitrogen and hydrophobic organic pollutants in cases where reject water is circulated to the headworks of an STP.

#### **General information**

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Jyväskylän yliopisto, University of Jyväskylä  
Contributors: Marttinen, S. K., Ruissalo, M., Rintala, J. A.  
Number of pages: 7  
Pages: 103-109

Publication date: Nov 2004

Peer-reviewed: Yes

### Publication information

Journal: Journal of Environmental Management

Volume: 73

Issue number: 2

ISSN (Print): 0301-4797

Ratings:

Scopus rating (2004): SJR 0.536 SNIP 1.07

Original language: English

ASJC Scopus subject areas: Environmental Science(all), Management, Monitoring, Policy and Law

Keywords: Bioavailability, Di (2-ethylhexyl) phthalate, Reject water, SBR

DOIs:

10.1016/j.jenvman.2004.05.011

Source: Scopus

Source ID: 15344344830

Research output: Contribution to journal › Article › Scientific › peer-review

### Problems related to field vane testing in soft soil conditions and improved reliability of measurements using an innovative field vane device

In Finland, undrained shear strength is commonly measured using the field vane shear test (FV). Currently, the most commonly used field vane testers are the Nilcon vane and the electrical vane with shear rotation and measuring systems located above the ground level. Vane testing is normally carried out using vanes equipped with slip coupling, while the use of casing for protecting the vane is not very common. Recent studies from Finland have shown that the undrained shear strength of clays can be significantly underestimated when casing is not used. Experimental observations suggest that the slip coupling might not always be sufficient to remove all of the rod friction effects that occur during testing. Tampere University of Technology has recently purchased an innovative field vane apparatus with a vane tester unit, where torque and rotations are measured right above the vane. In this way, the effect of rod friction is minimized and the measured stress-rotation behavior is less biased. In this study, issues related to practical applications, testing devices and interpretation methods are discussed. Then, a critical comparison between test results in soft clays from both the traditional and new field vane testers is performed.

### General information

Publication status: Published

MoE publication type: A3 Part of a book or another research book

Organisations: Civil Engineering, Norwegian Geotechnical Institute (NGI)

Contributors: Selänpää, J., Buò, B. D., Lämsivaara, T., D'Ignazio, M.

Number of pages: 11

Pages: 121-131

Publication date: 2017

### Host publication information

Title of host publication: Landslides in Sensitive Clays : From Research to Implementation

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ISBN (Print): 978-3-319-56486-9

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Name: Advances in Natural and Technological Hazards Research

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ISSN (Print): 1878-9897

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ASJC Scopus subject areas: Computers in Earth Sciences, Economic Geology, Global and Planetary Change, Management, Monitoring, Policy and Law, Geography, Planning and Development

Electronic versions:

problems\_related\_to\_field\_vane\_testing\_2017

DOIs:

10.1007/978-3-319-56487-6\_10

URLs:

<http://urn.fi/URN:NBN:fi:tuni-201910234045>

Source: Scopus

Source ID: 85020067264

Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

### **Determination of remoulding energy of sensitive clays**

Energy involved in disintegrating of sensitive clays from an intact to a fully remoulded state is one of the key aspects in assessing the post failure movements of sensitive clay landslides. This energy is referred to as remoulding energy. In this paper, the energy approach is conceptualised using an analytical approach. A comprehensive review of the empirical, laboratory and field techniques to estimate remoulding energy are presented and discussed in detail.

#### **General information**

Publication status: Published  
MoE publication type: A3 Part of a book or another research book  
Organisations: Civil Engineering, Norwegian Univ. of Sci. and Technol.  
Contributors: Thakur, V., Degago, S. A., Selänpää, J., Länsivaara, T.  
Number of pages: 11  
Pages: 97-107  
Publication date: 2017

#### **Host publication information**

Title of host publication: Landslides in Sensitive Clays : From Research to Implementation  
Publisher: Springer  
ISBN (Print): 978-3-319-56486-9  
ISBN (Electronic): 978-3-319-56487-6

#### **Publication series**

Name: Advances in Natural and Technological Hazards Research  
Volume: 46  
ISSN (Print): 1878-9897  
ISSN (Electronic): 2213-6959  
ASJC Scopus subject areas: Computers in Earth Sciences, Economic Geology, Global and Planetary Change, Management, Monitoring, Policy and Law, Geography, Planning and Development  
DOIs:  
10.1007/978-3-319-56487-6\_9  
Source: Scopus  
Source ID: 85020126453  
Research output: Chapter in Book/Report/Conference proceeding > Chapter > Scientific > peer-review

### **Advances in determining $\Delta u$ and $S_u$ for limit equilibrium analyses**

It is well known that in undrained stability calculations, total stress and effective stress analyses do not give the same calculated factor of safety when  $FOS > 1$ . This is due to the fact that shear strength is defined differently in these two approaches: In total stress analyses, the mobilised shear stress is compared to undrained shear strength, i.e. strength at failure. In undrained effective stress analyses, the shear strength is defined as corresponding to the mobilised effective stress state. This causes an overestimation of FOS in undrained  $\phi'-c'$  analyses. Modelling of excess pore pressure  $\Delta u$  has traditionally been source of most uncertainty in undrained effective stress analyses. Having the correct shear strength along the slip surface can be considered the most crucial detail in all stability analyses. It can be argued that in the context of Limit Equilibrium analyses where deformations are not considered, priority should be given to calculating the shear strength correctly, instead of attempting to obtain a "correct" mobilised  $\Delta u$  value. This paper gives a general introduction to the new HSU (Hybrid su) method. For the purposes of LEM analyses,  $\Delta u$  is calculated so that the resulting Mohr-Coulomb shear strength corresponds to the assumed failure state. This approach solves the inherent overestimation of FOS in undrained  $\phi'-c'$  analyses. To predict the effective stress at failure, a constitutive effective stress soil model is employed. Also presented is a concept of deriving undrained shear strength  $S_u$  in LEM, based on an effective stress soil model. This makes it possible to conduct the LEM stability analysis in terms of total stresses, while deriving soil strength from effective strength parameters. The different approaches of calculating  $\Delta u$  and  $S_u$  with the HSU method are compared using a theoretical stability calculation example. The relative merits of the different approaches are discussed.

#### **General information**

Publication status: Published  
MoE publication type: A3 Part of a book or another research book  
Organisations: Civil Engineering, Ramboll Finland Ltd.  
Contributors: Lehtonen, V., Länsivaara, T.  
Number of pages: 11  
Pages: 237-247  
Publication date: 2017

#### **Host publication information**

Title of host publication: Landslides in Sensitive Clays : From Research to Implementation  
Publisher: Springer

ISBN (Print): 978-3-319-56486-9  
ISBN (Electronic): 978-3-319-56487-6

### Publication series

Name: Advances in Natural and Technological Hazards Research

Volume: 46

ISSN (Print): 1878-9897

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ASJC Scopus subject areas: Computers in Earth Sciences, Economic Geology, Global and Planetary Change, Management, Monitoring, Policy and Law, Geography, Planning and Development

DOIs:

10.1007/978-3-319-56487-6\_21

Source: Scopus

Source ID: 85020069216

Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

### Effects of sample disturbance in the determination of soil parameters for advanced finite element modelling of sensitive clays

The stress-strain response of sensitive clays tested in a laboratory setting can be significantly affected by disturbance effects caused by sampling, transport, storage and specimen preparation. Soil models for finite element analyses are commonly calibrated using the results from laboratory tests and, consequently, calibrated model parameters are likely to be affected by sample disturbance. For sensitive clays subjected to constant volume shearing, the stress-strain behavior is dependent on the direction of loading and, due to build-up of shear induced pore pressure, effective stresses will reduce with increasing strain in the post-peak regime. According to previous studies, peak strengths, strains at failure and postpeak behavior of sensitive clays are all significantly influenced by sample quality. Therefore, the relative quality of model predictions generated using a sensitive clay finite element model can also be expected to be notably affected by sample disturbance. In this study, the impact of sample disturbance on the determination of model input parameters for advanced finite element modelling of sensitive clays is addressed and critically discussed. Two advanced soil models are used for this purpose: the total stress based NGI-ADPSOFT model, which is able to predict the anisotropic strain-softening behavior of saturated sensitive clays, and the effective stress based S-CLAY1S model, which is characterized by an anisotropic yield surface and is able to simulate soil destructuration. The practical implications of a thoughtful selection of the input parameters are evaluated through FE stability analyses of a sensitive clay slope.

### General information

Publication status: Published

MoE publication type: A3 Part of a book or another research book

Organisations: Civil Engineering, Norwegian Geotechnical Institute (NGI), Ramboll Finland Ltd., University of Delaware

Contributors: D'Ignazio, M., Jostad, H. P., Lämsivaara, T., Lehtonen, V., Mansikkamäki, J., Meehan, C.

Number of pages: 9

Pages: 146-154

Publication date: 2017

### Host publication information

Title of host publication: Landslides in Sensitive Clays : From Research to Implementation

Publisher: Springer

ISBN (Print): 978-3-319-56486-9

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### Publication series

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ASJC Scopus subject areas: Computers in Earth Sciences, Economic Geology, Global and Planetary Change, Management, Monitoring, Policy and Law, Geography, Planning and Development

DOIs:

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Source: Scopus

Source ID: 85020127433

Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

### Multifrequency PolSAR Image Classification Using Dual-Band 1D Convolutional Neural Networks

In this work, we propose a novel classification approach based on dual-band one-dimensional Convolutional Neural Networks (1D-CNNs) for classification of multifrequency polarimetric SAR (PolSAR) data. The proposed approach can jointly learn from C- and L-band data and improve the single band classification accuracy. To the best of our knowledge,

this is the first study that introduces 1D-CNNs to land use/land cover classification domain using PolSAR data. The proposed approach aims to achieve maximum classification accuracy by one-time training over multiple frequency bands with limited labelled data. Moreover, the proposed dual-band 1D-CNN approach yields a superior computational efficiency compared to the deep 2D-CNN based approaches. The performed experiments using AIRSAR PolSAR image over San Diego region at C- and L-bands have shown that the proposed approach is able to simultaneously learn from the C- and L-band SAR data and achieves an elegant classification performance with minimal complexity.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences, Research group: Multimedia Research Group - MRG, Qatar University, Izmir University of Economics

Contributors: Ahishali, M., Kiranyaz, S., Ince, T., Gabbouj, M.

Number of pages: 4

Pages: 73-76

Publication date: 1 Mar 2020

#### Host publication information

Title of host publication: 2020 Mediterranean and Middle-East Geoscience and Remote Sensing Symposium, M2GARSS 2020 - Proceedings

Publisher: IEEE

ISBN (Electronic): 9781728121901

ASJC Scopus subject areas: Management, Monitoring, Policy and Law, Instrumentation, Earth and Planetary Sciences (miscellaneous), Atmospheric Science, Computers in Earth Sciences, Earth-Surface Processes, Aerospace Engineering, Global and Planetary Change

Keywords: 1D Convolutional Neural Networks, land use/land cover classification, multifrequency classification, Polarimetric Synthetic Aperture Radar (PolSAR)

DOIs:

10.1109/M2GARSS47143.2020.9105312

#### Bibliographical note

EXT="Kiranyaz, Serkan"

EXT="Ince, Turker"

Source: Scopus

Source ID: 85086740246

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Double-side pumped membrane external-cavity surface-emitting laser (MECSEL) with increased efficiency emitting > 3 W in the 780 nm region

We demonstrate a double-side pumped MECSEL emitting more than 3 W of output power in the 780 nm wavelength region. The laser exhibits an efficiency as high as 34.4 %.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Physics

Contributors: Kahle, H., Phung, H., Penttinen, J., Rajala, P., Tukiainen, A., Ranta, S., Guina, M.

Publication date: 1 May 2019

#### Host publication information

Title of host publication: 2019 Conference on Lasers and Electro-Optics, CLEO 2019 - Proceedings

Publisher: IEEE

ISBN (Electronic): 9781943580576

ASJC Scopus subject areas: Spectroscopy, Industrial and Manufacturing Engineering, Safety, Risk, Reliability and Quality, Management, Monitoring, Policy and Law, Electronic, Optical and Magnetic Materials, Radiology Nuclear Medicine and imaging, Instrumentation, Atomic and Molecular Physics, and Optics

DOIs:

10.23919/CLEO.2019.8749958

#### Bibliographical note

INT=phys,"Rajala, Patrik"

Source: Scopus

Source ID: 85069191246

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Optical Frequency Comb Photoacoustic Spectroscopy**

We combine for the first time a mid-infrared optical frequency comb Fourier transform spectrometer with cantilever-enhanced photoacoustic detection and measure high-resolution broadband spectra of the fundamental band of methane in a few milliliter sample volume.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Physics, Energy Technology and Thermal Process Chemistry, University of Helsinki

Contributors: Sadiq, I., Mikkonen, T., Vainio, M., Toivonen, J., Foltynowicz, A.

Publication date: 1 May 2019

#### **Host publication information**

Title of host publication: 2019 Conference on Lasers and Electro-Optics, CLEO 2019 - Proceedings

Publisher: IEEE

ISBN (Electronic): 9781943580576

ASJC Scopus subject areas: Spectroscopy, Industrial and Manufacturing Engineering, Safety, Risk, Reliability and Quality, Management, Monitoring, Policy and Law, Electronic, Optical and Magnetic Materials, Radiology Nuclear Medicine and imaging, Instrumentation, Atomic and Molecular Physics, and Optics

DOIs:

10.23919/CLEO.2019.8749688

Source: Scopus

Source ID: 85069190764

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Frequency Comb Generation in a Continuous-Wave Pumped Second-Order Nonlinear Waveguide Resonator**

Optical frequency comb generation has been experimentally studied using an integrated system based on a lithium niobate waveguide resonator featuring a strong quadratic nonlinearity. Our theoretical model shows good agreement with the experimental results.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Physics, Paderborn University, University of Helsinki, VTT Technical Research Centre of Finland

Contributors: Abdallah, Z., Stefszky, M., Ulvila, V., Silberhorn, C., Vainio, M.

Publication date: 1 May 2019

#### **Host publication information**

Title of host publication: 2019 Conference on Lasers and Electro-Optics, CLEO 2019 - Proceedings

Publisher: IEEE

ISBN (Electronic): 9781943580576

ASJC Scopus subject areas: Spectroscopy, Industrial and Manufacturing Engineering, Safety, Risk, Reliability and Quality, Management, Monitoring, Policy and Law, Electronic, Optical and Magnetic Materials, Radiology Nuclear Medicine and imaging, Instrumentation, Atomic and Molecular Physics, and Optics

DOIs:

10.23919/CLEO.2019.8750403

Source: Scopus

Source ID: 85069196416

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **High-Q resonance train in a plasmonic metasurface**

We experimentally demonstrate a plasmonic surface that supports a series of high-quality-factor ( $Q \approx 100$ ) surface lattice resonances. These resonances are enabled by tuning the thickness of the top-cladding layer to confine higher order diffraction-orders.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Physics, University of Ottawa, Canada, Iridian Spectral Technologies, University of Rochester Institute of Optics

Contributors: Saad-Bin-Alam, M., Reshef, O., Huttunen, M. J., Carlow, G., Sullivan, B., Menard, J. M., Dolgaleva, K., Boyd, R. W.

Publication date: 1 May 2019

### Host publication information

Title of host publication: 2019 Conference on Lasers and Electro-Optics, CLEO 2019 - Proceedings

Publisher: IEEE

ISBN (Electronic): 9781943580576

ASJC Scopus subject areas: Spectroscopy, Industrial and Manufacturing Engineering, Safety, Risk, Reliability and Quality, Management, Monitoring, Policy and Law, Electronic, Optical and Magnetic Materials, Radiology Nuclear Medicine and imaging, Instrumentation, Atomic and Molecular Physics, and Optics

DOIs:

10.23919/CLEO.2019.8750206

Source: Scopus

Source ID: 85069156893

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### The variation of air and surface temperatures in London within a 1km grid using vehicle-transect and ASTER data

Urbanisation can modify the local climate, increasing the temperature of cities compared to rural areas. This phenomenon is known as the Urban Heat Island (UHI), and this paper introduces a methodology to investigate the spatial variability of air and surface temperatures across London. In particular, this study aims to investigate if a widely used spatial resolution (1 km) is appropriate for heat-related health risk studies. Data from vehicle-transect and ASTER thermal images were overlaid on a reference grid of 1 km, used by UHI simulation models. The results showed higher variability of air temperature within some specific modelled grid cells in the city centre, while surface temperatures presented higher variability in the London borders. This investigation suggests that LST has larger variation levels and more grid cells with sub-grid variation above 1°C compared to air temperature measurements.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: University College London, London School of Hygiene and Tropical Medicine

Contributors: Dos Santos, R. S., Taylor, J., Davies, M., Mavrogianni, A., Milner, J.

Publication date: 10 May 2017

### Host publication information

Title of host publication: 2017 Joint Urban Remote Sensing Event, JURSE 2017

Publisher: Institute of Electrical and Electronics Engineers Inc.

Article number: 7924613

ISBN (Electronic): 9781509058082

### Publication series

Name: 2017 Joint Urban Remote Sensing Event, JURSE 2017

ASJC Scopus subject areas: Signal Processing, Urban Studies, Management, Monitoring, Policy and Law, Instrumentation

DOIs:

10.1109/JURSE.2017.7924613

URLs:

<http://www.scopus.com/inward/record.url?scp=85020236643&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 85020236643

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Software design for simulating microbial bioprocesses in bioreactor

UML based software design use is presented to implement a simulation environment. Simulation environment will be a software application which will provide a playground for researchers to simulate bioreactor experiments involving microbial species and predict the products of the experiment. Four subsystems namely: Feed system, Bioreactor system, Microbial system and Products system were identified and are presented as four major classes. The implementation of the system is left open at this stage and simulation environment can be implemented using object oriented programming languages like C++, JAVA and platforms like MATLAB (Simulink).

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Chemistry and Bioengineering, President, Research group: Industrial Bioengineering and Applied Organic Chemistry, Department of Signal Processing, Research area: Information Technology for Biology and Health, Research area: Intelligence in Machines, Research group: MMDM, Research area: Signal and Information Processing, Prostate cancer research center (PCRC), Urban circular bioeconomy (UrCirBio), Tampere University of Technology, Institute of Signal Processing

Contributors: Nikhil, Puhakka, J. A., Visa, A., Yli-Harja, O.  
Publication date: 2014

### Host publication information

Title of host publication: 6th International Conference on Environmental Informatics, ISEIS 2007

Publisher: International Society for Environmental Information Sciences

Article number: 60700018

ASJC Scopus subject areas: Environmental Engineering, Renewable Energy, Sustainability and the Environment, Management, Monitoring, Policy and Law, Water Science and Technology

Keywords: Bioreactor, Microbial bioprocess, Simulation environment, Software design, UML

URLs:

<http://www.scopus.com/inward/record.url?scp=84915751131&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84915751131

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### Editorial

#### General information

Publication status: Published

MoE publication type: B1 Article in a scientific magazine

Organisations: Civil Engineering

Contributors: Länsivaara, T.

Number of pages: 1

Publication date: 17 Dec 2018

Peer-reviewed: No

#### Publication information

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Volume: 5

Issue number: 6

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Scopus rating (2018): CiteScore 3.4 SJR 0.602 SNIP 0.899

Original language: English

ASJC Scopus subject areas: Environmental Engineering, Environmental Chemistry, Water Science and Technology, Geotechnical Engineering and Engineering Geology, Waste Management and Disposal, Geochemistry and Petrology, Nature and Landscape Conservation, Management, Monitoring, Policy and Law

DOIs:

10.1680/jenge.2018.5.6.309

Source: Scopus

Source ID: 85059019429

Research output: Contribution to journal › Editorial › Scientific