2015 ENVIRONMENTAL TECHNOLOGY AND MANAGEMENT CONFERENCE

THE 5TH
ENVIRONMENTAL TECHNOLOGY AND MANAGEMENT CONFERENCE
NOVEMBER 23RD - 24TH 2015
BANDUNG, INDONESIA

EDITOR IN CHIEF
Prof. Dr. Ir. Enri Damanhuri

PROCEEDINGS BOOK

Proceedings

The 5th Environmental Technology and Management Conference

Green Technology towards Sustainable Environment

23 - 24 November 2015, Bandung, Indonesia

Editor in Chief

Prof. Dr. Ir. Enri Damanhuri

Published by

Faculty of Civil and Enviromental Engineering

Institut Teknologi Bandung – Indonesia

ISBN 978-979-98278-5-2

Proceedings

The 5th Environmental Technology and Management Conference

Green Technology towards Sustainable Environment

ISBN: 978-979-98278-5-2

Publisher:
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CONTENTS

YOKE PEAN THYE AGUS JATNIKA EFFENDI PRAYATNI SOEWONDO DAMIR BRDJANOVIC TJANDRA SETIADI	Survey On The Implementation Of Tools To Support The Development Of Emergency Sanitation Products	OP/AE/015
EDWAN KARDENA LUHUR AKBAR DEVIANTO KURNIASIH HERTO DWI ARIESYADY AMINUDIN SULAEMAN	Biosorption And Desorption Of Chromium From Immobilized Microalgae Biosorbent	OP/AE/016
HERLIAN ERISKA PUTRA KANIA DEWI ARI DARMAWAN PASEK ENRI DAMANHURI	Hydrochar Production From Municipal Solid Waste By Hydrothermal Carbonization Under Low Temperature Condition	OP/AE/020
VERA BARLIANTI EKA TRIWAHYUNI JOKO WALUYO AJENG ARUM SARI	Decolorization Of Black Liquor From Bioethanol G2 Production Using Iron Oxide Coating Sands	OP/AE/022
NOPA DWI MAULIDIANY PRAYATNI SOEWONDO	Kinetic Study of COD Removal From Bandung Municipal Wastewater in Continue Moving Bed Biofilm Reactor System	OP/AE/023
TITIK ISTIROKHATUN MUAMMAR FIKRI ZAMANI SUDARNO HERU SUSANTO	Treatment of Landfill Leachate by Using Nanofiltration Membranes	OP/AE/025
DYAH WULANDARI PUTRI DEWI FITRIA MARLISA DIAN ARDINA KUSUMANINGAYU PRAYATNI SOEWONDO AGUS JATNIKA EFFENDI TJANDRA SETIADI	Organic Substance Removal Using Modified Tripikon-S System	OP/AE/026

EDY WIYONO SITI SYAMSIAH SARTO HARWIN SAPTOADI	Combustion of Municipal Solid Wastes by Using Self Burning Incinerator	OP/AE/030
HANA PUSPITASARI NURINA FITRIANI NIEKE KARNANINGROEM	Test in Using Animal Bones as Natural Coagulant for River Water Treatment	OP/AE/032
ANNISA ATHIFAH INDAH RACHMATIAH SITI SALAMI	Quality Improvement Evaluation Of Textile Waste Water Bodies Receiver With Simple Filtration Process (Case Study: Cikakembang River)	OP/AE/033
HERMAWATI WIDYAPRATAMI MINDRIANY SYAFILA	Chemical Oxygen Demand (COD) Kinetics and Removal Efficiency of Biologically Treated Landfill Leachate Bantargebang Landfill with Advanced Oxidation Process of Ozone and Hydrogen Peroxide	OP/AE/035
RISYANA SUKARMA	Pressurized Ceramic Filter And Its Impact In Filtrating Effectiveness	OP/AE/037
AMRINI AMALIA SHAFDAR HERTO DWI ARIESYADY	The Optimization Of Active Cultivated Bacterial Consortium Application In The Activated Sludge Process Of Painting Wastewater Treatment	OP/AE/039
LITA DARMAYANTI EDY SAPUTRA SUPRIHANTO NOTODARMODJO ENRI DAMANHURI ADE ANGGRIAWAN	Kaolin-Based Geopolymeric Adsorbent For Fe And Mn Removal From Peat Water (Research Ongoing)	OP/AE/040
ANDRI GUMILAR MARISA HANDAJANI MINDRIANY SYAFILA	Influence Of N2 Flushing For The Ethanol Production From High Concentration Of Organic Waste	OP/AE/041

HIDAYATUL MUSTAFIDAH BIEBY VOIJANT TANGAHU	Growth Rate Of Scirpus Grossus Egeria Densa And Salvinia Molesta For Wastewater Treatment Of Soil Washing Oil Contaminated	OP/AE/050
TIKA KUMALA SARI ALIA DAMAYANTI	Filtration Laundry Waste Water Using Zeolite Nanofiltration Membrane To Remove Turbidity And Phosphate	OP/AE/053
IPUNG FITRI PURWANTI SITI ZULAIKAH DIDIK BAMBANG SUPRIYADI SETYO BUDI KURNIAWAN	Minimum Inhibitory Consentration of Chromium (III) By Bacteria as Preliminary Test of Chromium Biosorption	OP/AE/055
RENY ADIAMI NURHAYATI HERTO DWI ARIESYADY	Study of Phophorus Cycling Bacteria Biodiversity as Bioindicator Toxicity of Domestic Waste and Industrial Polution Upper Citarum River	OP/AE/057
YUNIATI ZEVI REFNILDA FADHILAH	Heavy Metals Removal From Urban Stormwater Runoff Using Lab-Scale Biofiltration Systems: Influence Of Filter Media Combination	OP/AE/059
QOMARUDIN HELMY MUSFIANDINI ZAHRA SUPRIHANTO NOTODARMOJO	A Small-Scale, Low-Technology Water Treatment Plant: The Treatment Of Raw Water With High Suspended Clay, Iron, And Manganese	OP/AE/060
AINI ZAHRA MARISA HANDAJANI	Water Flow Characterization In Longitudinal Section Of Oxidation Ditch Reactor Using Cfd Simulation	OP/GC/003
SINARDI PRAYATNI SOEWONDO SUPRIHANTO NOTODARMOJO CYNTHIA RADIMAN	Chitosan from *Mytilus virdis linneaus* Shell as a Natural Coagulant	OP/GC/004
ENDAH WAHYUNI BUDI SUSWANTO INDRA KOMARA	Effects Of Angle Of Inclination Cables On The Performance Of Submerged Floating Tunnel Under Hydrodynamic Load	OP/GC/015

AINI ZAHRA MARISA HANDAJANI	Nitrification Kinetics In Aquaculture Wastewater Treatment Using Batch Reactor	OP/GC/025
RENY ADIAMI NURHAYATI HERTO DWI ARIESYADY	Study Of Phosphate Solubilizing A Bacteria Biodiversity As Bioindicator Of Domestic Wastewater and Industrial Pollution At Upper Citarum River, West Java, Indonesia	OP/AE/057

AIR QUALITY AND CLIMATE CHANGE

ASEP SOFYAN LAILATUS SIAMI RUSS BONA FRAZILA	Emission Reduction From Implementation Of Bus Rapid Transit Corridor 13th In Jakarta	OP/AQ/001
T. KITADA	Modeling Of Wet Deposition In Chemical Transport Simulation	OP/AQ/006
HERMAWAN PUTI FARIDA MARZUKI MUHAMAD ABDUH R. DRIEJANA	The Role Of Construction Supply Chain To The Climate Change	OP/AQ/010
KANIA DEWI MOH. IRSYAD	Development of Time Correction Factors for Measurement of TSP and PM10 Ambient Concentration in Complying Indonesian Air Quality Standard	OP/AQ/011
MADE SANDHYANA ANGGA ARIEF SUDRADJAT	Vehicle Emission Modeling Use Cohort Modeling In Bali Province	OP/AQ/016
WIWIEK SETYAWATI ENRI DAMANHURI	Correlation Between The Depth And Physical-Chemical Properties Of Tropical Peat (Study Case: Pontianak, West Kalimantan)	OP/NR/017
SUPRIHATIN ANDRE WAHYU NUGROHO ONO SUPARNO SARONO	Life Cycle Assessment Of Integrated Palm Oil Industry With Scenarios Of Liquid And Solid Wastes Utilization And Integration With Cattle Farm	OP/NR/035

JOKO WIRATMO RUMINTA	Risk Of Rice Production Due To Climate Change In Indonesia (Case Study: District Of Karawang, West Java)	OP/NR/036
DRIEJANA MIRANTI MAYANGSARI AKHMAD RIQQI	30"-Grid Resolution Of Domestic Emission Mapping In Bandung City	OP/NR/045
ECO-INDUSTRIES		
AYU NINDYAPUSPA MASRULLITA YULINAH TRIHADININGRUM	Stabilization/Solidification Of Waste Containing Heavy Metals And Hydrocarbon Using Portland Cement And Bentonit	OP/EI/002
ELZAVIRA FELAZA CINDY RIANTI PRIADI	Implementation Of Cleaner Production In A Natural Dye Batik Industry Sme: A Way To Enhance Biodegradability Of Batik Wastewater?	OP/EI/003
SRI GUSTIANI QOMARUDIN HELMY SUPRIHANTO NOTODARMOJO	Treatment Of Textile Wastewater By Uv/Zno Nanoparticle As An Advanced Oxidation Process	OP/AE/058
R.FATKHURRAHMAN ERLANGGA SYAIFFUL AMRI KEMALA OKTAVIANI YOHAN	A New Prospective Soil Remediation Contamined By Mercury From Artisanal Gold Mining Using Natural Zeolite As A Microtechnology	OP/NR/022
YUYUN ISMAWATI LELITASARI SARAH E. ROTHENBERG SONIA BUFTHEIM	Gold Production In Rural Areas Of Bogor Regency And Its Hidden Hazards Implication	OP/NR/042
DEWI PERMATA IFADIANA JULI SOEMIRAT	An Analysis of the Effect of the Implementation of an Integrated Management System (IMS) on Work Ergonomics in O&M Power Plant Company	OP/OS/001

BIEBY VOIJANT TANGAHU ARSETYO YEKTI BAGASTYO ELSITA OCTARINA NAREGA HERMANIAR HIDAYATUL MUSTAFIDAH	Batik Industry Wastewater Preliminary Toxicity Test Against of Aquatic Plants	OP/AE/043

GREEN CITIES & INFRASTRUCTURES

ANNI ROCHAENI ENRI DAMANHURI MOCHAMMAD CHAERUL TRI PADMI	Factor Analysis . Of Solid Waste Collecting System In Bandung City	OP/GC/001
HAFNIDAR A. RANI SUPRIATNA	Green Infrastructure Innovation Towards Sustainable Environment In Aceh	OP/GC/007
WARMADEWANTHI WILUJENG S. PANDEBESIE E. HERUMURTI W. TRIHADININGRUM Y	The Analysis of Household and Commercial Waste Reduction in Surabaya (Case study : Gudeng, Simokerto, and Wonokromo District)	OP/GC/009
MOHD. SYARIF HIDAYAT	Ecological Evaluation Of The Several Urban Green Spaces In Jakarta	OP/GC/014
JUN SAKAMOTO KAZUKATA KUBOTA SHOTARO YADA	Time Series Analysis on Mass Media Report and Utilization on Social Media - Case Of Local Railway	OP/GC/018
FRANSISCA A.D ANGGRAENI NURINA FITRIANI EDDY S. SOEDJONO	Study Of Successful To Stop Open Defecation Free (Odf) In Tutur Subdistrict And Duplication Of Successful In Pandaan Subdistrict, Pasuruan District, Indonesia	OP/GC/019
IENDRA SOFYAN PRAYATNI SOEWONDO TRESNA DARMAWAN KUNAEFI MARISA HANDAJANI	A Review Of Waste Water Treatment Management In Slum Area (Case Study: Greater Bandung Area)	OP/GC/022
DONNY DHONANTO TRIANA SHARLY PERMAISURI ARIFIN CITRA ANGGITA	Master Plan Road Network In The Border Region Of Malinau Regency Of The North Kalimantan Province	OP/GC/026

HERU PURBOYO HIDAYAT PUTRO NUR IDA FITRIANTI	The Role Of Public Participation In Improving Bike Lanes In Taman Ayodya And Banjir Kanal Timur In Jakarta, Indonesia	OP/GC/027
AYU LISTIANI EMENDA SEMBIRING HARMEIN RAHMAN	Evaluation Of Expanded Polystyrene (Eps) Plastic Waste Utilization As An Asphalt Substitution Material In Asphalt Concrete-Wearing Course Layer	OP/AE/029
NIEKE KARNANINGROEM NURINA FITRIANI YULIA PUSPA RACHMANIATI	The Assessment Of River Capacity And Capability In Surabaya City As Basic Determination Of Typical On Site Infiltration System	OP/AE/034
DIEN F. AWALIYAH MARISA HANDAJANI	The Effectivity Of Biopore Infiltration Hole Applications To Increase Water Infiltration Rate In Soil	OP/AE/036
ELVITA SARI SARAGI ARSETO YEKTI BAGASTYO	Reduction Of Organic Solid Waste By Black Soldier Fly (Hermetia Illucens) Larvae	OP/AE/044
SIDI BOEDI DARMA	Appropriate Waste Water Infrastructure For Sustainable Informal Housing Settlement In Bandung	OP/AE/048
WILMA NURRUL ADZILLAH EMENDA SEMBIRING MARISA HANDAJANI	Alternative Selection Of Waste Water Treatment In Depok City Using Dependence And Driving Power Analysis (DDPA) And Analytic Network Process (ANP) Method	OP/NR/011
WONG LI HUN FAUZIAH SHAHUL HAMID	Municipal Sanitary Landfill Leachate Characterization And Its Acute And Chronic Effects On Survival, Development And Growth Of Larval Dark-Sided Chorus Frog, Microhyla Heymonsi	OP/NR/016

SRI MARYATI AN NISAA' SITI HUMAIRA	Co-Benefits Of Community Based Water Supply Management	OP/NR/018
KIYOSHI WADA YUKIO OTA	Development Of The Siphon System Pipe-Type Fishway And Monitoring Of Fish Migration	OP/NR/019
ANNISA NUR SABRINA INDAH RACHMATIAH S. S.	Evaluation Of Raw Water Quality In Pdam Bandung (Study Area : Dago Bengkok, Bantar Awi, Dan Cikalong	OP/NR/023
LAURENTIA MUTIARA SANI WIDYAWATI HERTO DWI ARIESYADY MOCHAMMAD CHAERUL	Seasonal Variation Impact of Leachate Contamination to Shallow Groundwater in Burangkeng, Bekasi District, West Java, Indonesia	OP/NR/027
PUTRI CHISSY RAEZA RIANTI HERTO DWI ARIESYADY SISKA WIDYA DEWI KUSUMAH	Study On Bacterial Contamination And Its Dispersion In Groundwater Of Burangkeng Landfill Site, Bekasi Regency, West Java, Indonesia	OP/NR/028
I M A K SALAIN I K SUDARSANA W MUSTIKA	Mechanical Properties Of Concrete Using Nickel Slag As Coarse Aggregate	OP/NR/039
YOSHITAKA EBIE KEIZOU NIKI HIROSHI YAMAZAKI	Japanese Decentralized Domestic Wastewater Treatment System And Its Resilience To Natural Disaster	OP/NR/040
DEWI SARTIKA	Safety Study Of Using Salmonella Phage As A Natural Anti Microbe To Decrease Salmonella Contaminant On Food And Environmental	OP/OS/005
MUHAMMAD IQBAL ANINDYA NASTITI BARTI SETIANI MUNTALIF	Improved But Not Always Safe: A Microbial Water Quality Analysis In Bandung Peri-Urban Households	OP/OS/009

NATURAL RESOURCES

JEFRI FERLIANDE IDRIS MAXDONI KAMIL	Application of Ordinary Kriging And Idw For Predicting Soil Contaminants	OP/NR/001

AKHMAD RIQQI	Distribution in Industrial Area, Case Study: Rancaekek – Indonesia	
MARIANA MARSELINA ARWIN SABAR INDAH RACHMATIAH SITI SALAMI DYAH MARGANINGRUM	Optimization Management Of Hydroelectric Energetiç Exploitation Saguling Reservoir In Upper Citarum Cascade	OP/NR/002
MOCHAMAD ADI SEPTIONO DWINA ROOSMINI	Heavy Metal Distribution in Water, Sediment, and Fish at Upper Citarum River and Its Potential Exposure Pathway to Human	OP/NR/003
EVI AFIATUN SUPRIHANTO NOTODARMOJO AGUS JATNIKA EFFENDI DENI RUSMAYA SABAR SUPENDI	Determination of Surface Water Dominant Parameters to Optimize Drinking Water Source Management - Cikapundung River and Cisangkuy River, Bandung-Indonesia As a Case Study	OP/NR/004
HARY PRADIKO ARWIN PRAYATNI SOEWONDO YADI SURYADI	Runoff Coefficient Determination By Using The Scoring And Weighting Method In Upper Cikapundung Watershed	OP/NR/005
YONIK MEILAWATI YUSTIANI LEONY LIDYA	Development of River Water Quality Modeling Tool for Urban Rivers-Case Study of Cikapundung River, Bandung, Indonesia	OP/NR/006
SUHENRA MAULANA EMENDA SEMBIRING	Valuation of Flood By Means of Damage and Loss Method Case Study: Baleendah District Bandung Regency	OP/NR/007
CORNELIS H. VAN GINKEL GÜL ÖZEROL LUFIANDI	Water Quality Monitoring In The Upper Citarum River Basin: Rethinking The Role Of Stakeholders	OP/NR/008
FARADILLAH SAVES NADJADJI ANWAR MAS AGUS MARDYANTO THOMAS TRIADI PUTRANTO	Groundwater Modelling By Increasing Pumping Discharge In Probolinggo	OP/NR/009
MAS AGUS MARDYANTO	Effect Of Cikapundung Water Quality To	OP/NR/010

PUJI MENTARI SURIPTO	The Quality Of Unconfined Aquifer In Tamansari Sub-District Bandung	
DESSAEDA ADILLA IDRIS MAXDONI KAMIL	Economic Valuation Of Perum Perhutani's Community Based Forest Management (Cbfm) And Its Application As Riparian Buffer Zone Of Cipanji-Cisondari River In Bandung Regional	OP/NR/013
EVY HENDRIARIANTI NIEKE KARNANINGROEM	Rate Of Nitrification-Denitrification Brantas River In The City Of Malang	OP/NR/014
EKA WARDHANI SUPRIHANTO NOTODARMOJO	Assessment Of Heavy Metal Contamination In Surface Water And Sediments: A Case Study From Saguling Lake, West Java	OP/NR/015
ANDRI WARSA KADARWAN SOEWARDI	Estimation Of Phosphorus Loading And Its Impact On Eutrophication At Jatigede Reservoir, Sumedang-West Java, Indonesia	OP/NR/020
HERTO DWI ARIESYADY AMALIA RIZKA RAHMANI	The Diversity Of Nitrogen Cycling Bacteria As A Bioindicator Of Domestic And Industrial Wastewater Pollution In The Sediment Of Upper Citarum River, West Java, Indonesia	OP/NR/030
LUFIANDI GERTJAN GEERLING AGUS JATNIKA EFFENDI DWINA ROOSMINI	Water Quality Management And Water Pollution Control Under Decentralization In Indonesia: The Case Of Upper Citarum River Basin	OP/NR/032
RATIH PRATIWI INDAH RACHMATIAH SS	Combination Of Eichhornia Crassipes, Pistia Stratiotes, And Salvinia Molesta To Improve Water Quality Of Upstream Citarum River	OP/NR/038
KANIA DEWI YUYUN ISMAWATI	Inventory of Mercury Releases In Indonesia	OP/NR/041
YUNIATI ZEVI DEIFY NOVANDY MINDRIANY SYAFILA	Removal Of Iron And Manganese Ions From Groundwater By Sukabumi Greenstone: The Role Of Natural And Activated Modernite	OP/NR/043

GARY WOLINSKY TRI WISONO JAMAR SYAKIR	Net Environmental Benefit Analysis (NEBA) To Minimze Impacts On Communities And The Environment : Concept, Application And Case Studies	OP/NR/049
SARA McMILLEN TRI WISONO	Risk Based Screening Levels For Remediation Sites In Sumatera, Indonesia	OP/NR/050
DENI RUSMAYA FADJARI LUCIA NUGROHO YONIK M. YUSTIANI FAJAR IBNIL HAFIZ RUNIE B.T. PUTRI	Improving Artificial River Water Quality Using Mudballs Made From EM4, Rice Bran And Clay Soil	OP/AE/002
AMANDA LARASATI SUPRIHANTO NOTODARMOJO	Equilibrium and Kinetics of Orthophosphate Adsorption onto Indonesian Tropical Soils	OP/AE/011
NURUL CHAZANAH BARTI SETIANI MUNTALIF GEDE SUANTIKA PRIANA SUDJONO	Determination River Water Quality With Bioassessment Using Benthic Macroinvertebrates (Case Study : Citarum Upstream, West Java, Indonesia)	OP/AE/021
BIEBY VOIJANT TANGAHU ROCHMA SEPTI VYATRAWAN PRESTIANI PUTRI	The Effectivity of Adding Aeration Against Bioremediation Oil-Contaminated Soil	OP/AE/042
PLATO MARTUANI SIREGAR RUSMAWAN KARIN NADIRA DAUWANI	Standardized Precipitation Index Analysis For Drought Study Case At The Indramayu Region Crop Area West Java	OP/AQ/009
REGINAWATI HNDERSAH MARTHIN KALAY SONDI KUSWARYAN WAWAN HERMAWAN	Application Of Biofertilizer To Decrease Inorganic Fertilizer Dosage In Leafy Vegetables Production In Ambon, Mollucas	OP/GC/006
REO AUDI	Eco Innovation On Marine Litter Prevention: Case Studies Around The World	OP/GC/012
TAKAHIRO SHIMIZU	An Importance of Past Disaster Records – A Case Study of its Application After the Noubi Earthquake in Gifu –	OP/GC/017

EDDY SETIADY SOEDJONO NURINA FITRIANI AULIA RAMADANO	Study of the Involvement Financier in MDGs Sustainability in 2015 and Accelerate Achievement of the National Medium Development Plan in 2019 at Mojokerto	OP/GC/020
AFIF FAIQ MUHAMMAD SUSI. A. WILUJENG IDAA WARMADEWANTHI WELLY HERUMURTI ELLINA S. PANDEBESIE YULINAH TRIHADININGRUM	Evaluation of Non- Residential Solid Waste Collection In Simokerto District, Central Surabaya	OP/GC/021
YULIANA SURYANI ALIA DAMAYANTI EDDY SETIADY SOEDJONO ZULKIFLI YUSOP EIICHI NAKAKITA SUNMIN KIM	Flood Handling of Madiun River as a part of Bengawan Solo Waterhed by Utilizing the Capacity of Environment in Madiun City	OP/GC/029

OCCUPATIONAL SAFETY AND HEALTH

LEE VOTH-GAEDDERT IDRIS MAXADONI KAMIL DWINA ROOSMINI DANIEL OERTHER	Identifying The Long Term And Short Term Feedback Loops Impacting National Child Health Levels In Guatemala; An Application Of System Dynamics Modeling	OP/OS/006
DINA LUSIANA NUR ROHMAH	Safe Behavior on Workers Division of MSD in PT XYZ Kalimantan East Kalimantan	OP/OS/008
SYAHBANIATI PUTRI ANINDRYA NASTITI BARTI SETIANI MUNTALIF	Applying Quantitative Microbial Risk Assessment in Household Drinking Water Sources: A Case Study of Ujungberung Subdistrict, Bandung	OP/OS/010

ANINDRYA NASTITI BARTI SETIANI MUNTALIF ARIEF SUDRADJAT DWINA ROOSMINI A.J.M. SMITS S.V. MEIJERINK	Water Monitoring Beyond MDGs: A Case Study of Peri-Urban Bandung, Indonesia	OP/OS/011
FAIRUZ ZAHARANI INDAH RACHMATIAH SITI SALAMI	Urine and Hair Mercury Levels as Indicator Mercury Exposure in Artisanal Gold Miner in Desa Pasar Terusan Kecamatan Muara Bulian Kabupaten Batanghari-Jambi	OP/AE/051
SUDARNO PERTIWI ANDARANI M. AGUNG WIBOWO ASHANTHA GOONETILLEKA	Evaluation of Factors That Influence Performance of the Decentralized Wastewater Treatment System 'Sanimas'	OP/GC/013

POSTER PRESENTATION

APPROPRIATE & ADVANCED ENVIRONMENTAL TECHNOLOGY

IMAN DIMASSETYA YANUAR YUSUF SAHAT RICKY PRANATA OMPUSUNGGU ARSETO YEKTI BAGASTYO	Salt Recovery from Reverse Osmosis Concentrate Using Electrodialysis	PP/AE/002
YULINAH TRIHADININGRUM RHENY RATNAWATI INTAN DWI WAHYU SETYO RINI ARYA GHALI ARUDAM IDAA WARMADEWANTHI SRI RACHMANIA JULIASTUTI	Composting Process of Slaughterhouse Solid Waste Using Aerobic System	PP/AE/004
VERA BARLIANTI EKA TRIWAHYUNI DIAN BURHANI NURHASNI YANNI SUDIYANI	Xylitol Production from Residual Fermentation Broth of Bioethanol G2 Using Apergillus Niger	PP/AE/005

MURYANTO AJENG ARUM SARI HAZNAN ABIMANYU	Degradation of Black Liquor Wastewater from Bioethanol Process Using Coagulation and Fenton Methods	PP/AE/006
HITOE HABUCHI SHIORI FUJITA HIROFUMI TAKIKAWA	Photosensitivity of Graphitic Carbon Nitride Films Obtained by Evaporation	PP/AE/009
YULINAH TRIHADININGRUM RHENY RATNAWATI RIMA AULIYATI WULANDARI DEQI RIZKIVIA RADITA SRI RACHMANIA JULIASTUTI	Comparison of Slaughterhouse Solid Waste Treatment Using Anaerobic-Anoxic-Oxic and Aerobic Composting Methods	PP/AE/010
MUCHLIS MUNAWAR RITA ANGGRAINI	Synthesis of Lauryl Alcohol (Dodecanol) from Methyl-Laurate Ester using Zinc-Borohydride in Combination with Zinc-granular and Molecular Hydrogen (H2, gas) in Mild Condition	PP/AE/011
WILDA CHARISMA YUNAZ ARSETO YEKTI BAGASTYO	Subsequent Fenton Process and Neutralization for Wastewater Treatment of Textile Home Industry	PP/AE/013
FERI ARIYANTO ELLINA S.PANDEBESIE	A Mixture of Coconut Husk Waste and Water Hyacinth as a Medium of Oyster Mushroom Growth	PP/GC/004
DITA YUSTINE WINDANINGRUM TRIMURTI HESTI WARDINI	The Effect of Sarimukti Compost to Marginal Soil Quality and the Growth and Productivity of Capsicum Frutescens L.	PP/NR/007

GREEN CITIES & INFRASTRUCTURES

MUHAMMAD SAFRI LUBIS EMENDA SEMBIRING	Using GIS Web-Based To Show Environmental Status: A Case Study At Medan Environmental Bureau (BLH)	PP/AE/015

KOJI TAJIMA SHINYA NAKAMURA TADAHIKO SATO SHIGERU KOBAYASHI	A Prototype of Location Information Infrastructure using iBeacon for the Bicycle Touring	PP/GC/001
NURHAWA ABDUK RASHID AGAMUTHU P. FAUZIAH S.H.	Zinc Flow in A Municipal Solid Waste Landfill in Malaysia	PP/NR/004
ANNA FADLIAH RUSYDI JANUARI RIDWAN	Groundwater Quality in Coastal Aquifers	PP/NR/005
M.C. TRI ATMODJO	The Environmentally Friendly Slow Release Nitrogen Fertilizer Applied in Sugarcane (*Saccharum officinarum)*	PP/NR/008
SYARIFAH MELLY MAULINA EMENDA SEMBIRING	An Analyzing of Community's Ability and Willingness to Pay For Drinking Water Supply at Coastal Area (A Case Study at Telok Batang District, Kayong Utara Regency, West Borneo Province)	PP/NR/009
YUYUN ISMAWATI KRISHNA ZAKI SONIA BUFTHEIM ARWIN SABAR PRAYATNI SOEWONDO YADI SURYADI	Mercury Vapour In 3 ASGM Hotspots In Indonesia: Bombana, Sekotong, and Cisitu	PP/OS/002

AIR QUALITY & CLIMATE CHANGE

HAFIDAWATI PUJI LESTARI ASEP SOFYAN	Investigation of $PM_{2.5}$ and Black Carbon Concentration From Rice Straw Open Field Burning in District Cianjur, West Java	PP/AQ/002
YENY DHOKHIKAH YULINAH TRIHADININGRUM ELLINA SITEPU PANDEBESIE SONY SUNARYO	Estimation of GHGs Emission From Household Solid Waste Reduction in Sukolilo District, Eastern Subaya, Indonesia	PP/AQ/005

NATURAL RESOURCE MANAGEMENT

ROSMALINDA PERMATASARI ARWIN SABAR DANTJE KARDANA NATAKUSUMAH	Flow Provision for Suitable of Reservoir Storage Case Study : Ranau Lake-Upper Komering Watershed, South Sumatera, Indonesia	PP/NR/002
LISMINING PUJIYANTI A. ANDRI WARSA	Dissolved Oxygen Dynamics at Fish Culture Site, Djuanda Reservoir, West Java	PP/NR/003

ENVIRONMENTAL HEALTH AND RISK ASSESSMENT

RIZKA FIRDAUSI PERTIWI DWINA ROOSMINI	Risk Analysis of Vibration and Posture To Musculoskeletal Discomforts of Underground Mine Drilling Workers Case Study: PT. Karya Sakti Purnama	PP/OS/001
ROSETYATI RETNO UTAMI KATHARINA OGINAWATI	Risk Analysis of Cadmium (Cd) Exposure To Kidney Function Decreased of Car Spray Painters in Karasak Bandung	PP/OS/004

The 5th Environmental Technology and Management Conference "Green Technology towards Sustainable Environment" November 23 - 24, 2015, Bandung, Indonesia.

Survey on the implementation of measures to support the development of emergency sanitation products

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Abstract: *Organisations and individuals have been working to address gaps in excreta disposal during emergencies. However, developing a product that can be successfully sold and implemented is challenging. 35 tools that have the potential to facilitate the product development process were identified and evaluated through a survey of 67 stakeholders involved in emergency sanitation innovation. The results show that all 35 tools were considered useful to some extent, with field testing under emergency settings judged to be the most beneficial with the highest 'usefulness score'. However, when also considering the ease of implementation of these tools, a checklist of design requirements had the highest combined 'usefulness' and 'implementation' score. Although this simplified analysis has limitations, it provides a valuable starting point to understand how these tools could contribute to innovation in the emergency sanitation sector.*

Keywords: Emergency; innovation; product development; sanitation.

1. Introduction

Gaps in excreta disposal is one of the greatest within the emergency water, sanitation and hygiene (WASH) sector. Needs have been identified in the following areas: locations where latrine pits are not possible; latrine emptying and desludging; urban situations; sewage disposal, and; non-toilet, early response and mobile alternatives [1].

Encouragingly, organisations and individuals have been working, directly and indirectly, to address identified and perceived gaps. Donors appear to showing more interest in funding innovation in emergency sanitation [2]. Examples range from grant-making initiatives that provide funding to develop innovative solutions (such as the Humanitarian Innovation Fund), humanitarian agencies who work through various approaches to find improved ways to deliver emergency sanitation (such as the International Federation of the Red Cross and Red Crescent Societies and Oxfam GB as part of the Emergency Sanitation Project), and suppliers who are constantly coming up with new and better products to increase their sales.

At the same time, there has been growing recognition of the role and importance of innovation in the humanitarian sector. A few years ago, an independent review recommended that the United Kingdom's Department for International Development should facilitate innovation and its application [3]. As a result, DFID has made the promotion of innovation, the support for the development of new products and technologies, and large-scale testing of potential solutions a core part of its strategy [4].

However, developing a product that can be successfully sold and implemented is challenging. For instance, Brown et al. noted that decentralised wastewater treatment options (membrane bioreactors, constructed wetlands, and anaerobic filters) had been studied but not widely adopted [5]. One contributing explanation could be that not enough support is given to designing and disseminating products during the product development process. A survey by the authors showed strong agreement that better support should be provided to suppliers and product developers in understanding design requirements, evaluating product concepts, evaluating prototypes and promoting available products.

A number of tools that have the potential to facilitate the development process for emergency sanitation products were identified. This paper presents the results of a survey to investigate stakeholder opinions towards the usefulness and ease of implementation of these tools.

2. Methodology

A survey of stakeholders directly and indirectly involved in emergency sanitation innovation was undertaken from May to September 2014. The survey targeted any individual that had experience with, or been involved in, supplying or designing products for emergency sanitation; either directly or indirectly, or; was considering or

had considered supplying or designing products for emergency sanitation. An initial list of possible respondents was composed and contacted from sources of information on emergency sanitation innovation-related activities or outputs, such as: publications about new technologies and field trials; websites of suppliers, product developers and projects (e.g. the projects described in the introduction), and; participant lists from workshops and exhibitions (e.g. the emergency sanitation workshops and AidEx). An invitation to the survey was also posted in the Sustainable Sanitation Alliance forum and emailed to the relevant working group mailing list. Additional respondents were identified through snowball sampling. About 150 individuals were identified and invited.

67 responses were received. The respondents represent humanitarian agencies, non-governmental organisations, private companies, universities, research institutes, donor organisations as well as individual consultants and designers. The majority of respondents (61%) classified themselves as existing or potential suppliers and product developers. 25% supported the product development process rather than being directly involved. There were fewer respondents (six) who classified themselves as customers. Almost three-quarters of the respondents were from Europe or Northern America, with 19% from the Netherlands and 16% from the United Kingdom.

The survey comprised a self-administered structured questionnaire created in Microsoft Word as a 97-2003 document. Respondents had the option of either completing the form in Microsoft Word or printing out the document and filling it by hand. This paper draws on one of two major components of the questionnaire, which assessed the respondents' opinions on the extent to which specified measures would help suppliers and product developers and their ease of implementation. Respondents were asked to indicate their extent of agreement the statements on a seven-point Likert scale (Figure 1).

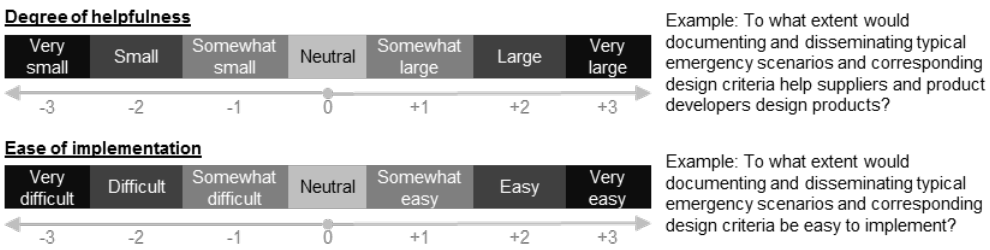

Figure 1. Types of Likert scales used in the questionnaire

The data collected was transcribed into Microsoft Excel 2010 and then extracted into RStudio (version 0.98.1062) for descriptive as well as statistical analyses. Where

required, the Likert scale was transformed to ordinal values for analysis (Figure 1).

3. Results

A total of 35 specific measures that have the potential to help suppliers and product developers were identified, categorised according to four major aspects of the product development process: understanding of design requirements, evaluation of product concepts, evaluation of prototypes, and the promotion of available products.

3.1 Usefulness and ease of implementation

Figure 2 illustrates the mean responses on the extent to which each measure would help suppliers and product developers design and disseminate emergency sanitation products ("usefulness score") as well as their ease of implementation ("implementation score"). The more significant results are highlighted in the figure and described below.

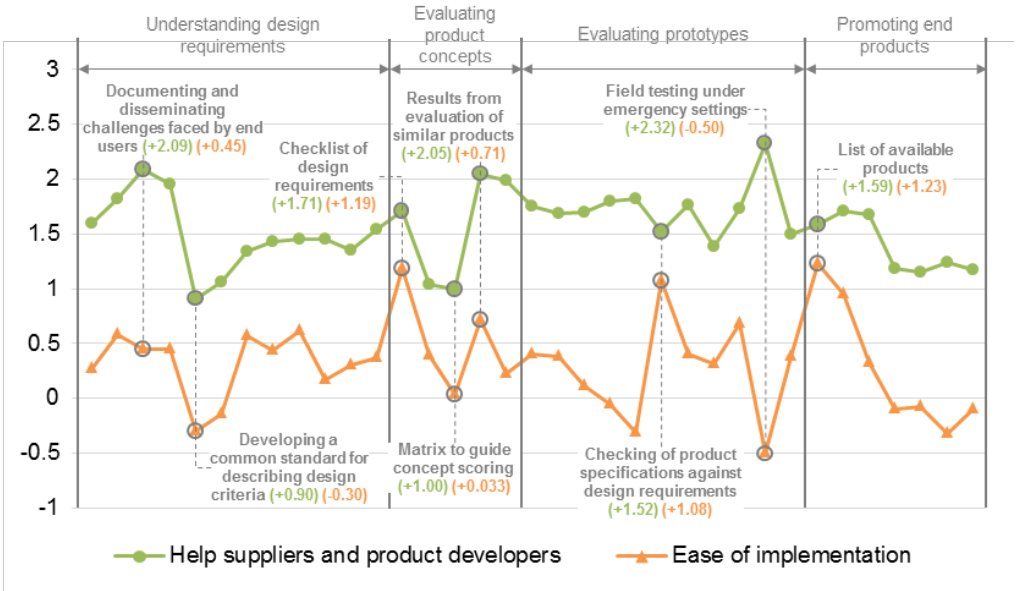

Figure 2. Mean response to each statement (Tools 1 – 35 not listed)

Overall, all the measures identified were considered by the respondents to be useful to some extent (mean usefulness score = +0.90 to +2.32). On the other hand, opinions of the ease of implementation of the measures were lower and more varied (mean implementation score = -0.50 to +1.23). The most useful tools for understanding design requirements are documenting and disseminating challenges faced by end users (mean usefulness score = +2.09) and the performance of existing products

during emergencies (+1.95). For evaluating product concepts, respondents felt that the documentation of results from the evaluation of similar products (+2.05) would be most helpful as well as a system where concepts could be reviewed by experts (+1.98). Although providing a checklist of design requirements is not as useful (+1.71), it was considered relatively easy to implement (mean implementation score = +1.19) compared to other tools. To evaluate prototypes, field testing under emergency settings was considered significantly more useful (mean usefulness score = +2.32) than other tools (including tools from other categories). However, in terms of ease of implementation, it was considered most difficult to implement among all the tools (mean implementation score = -0.50). In contrast, although the checking of product specifications against design requirements is not as useful (mean usefulness score = +1.52), it is much easier to implement (mean implementation score = +1.06). With regard to promoting end products, none of the measures were considered particularly useful, but providing a list of available products was seen as the tool that was the easiest to implement (mean implementation score = +1.23) among all the tools identified.

3.2 Combined usefulness and implementation scores

Figure 3 shows the overall results when the mean usefulness score is added to the mean implementation score for each tool. The figure clearly demonstrates that considering usefulness and ease of implementation could lead to a change in which tools are considered to be "better" than others.

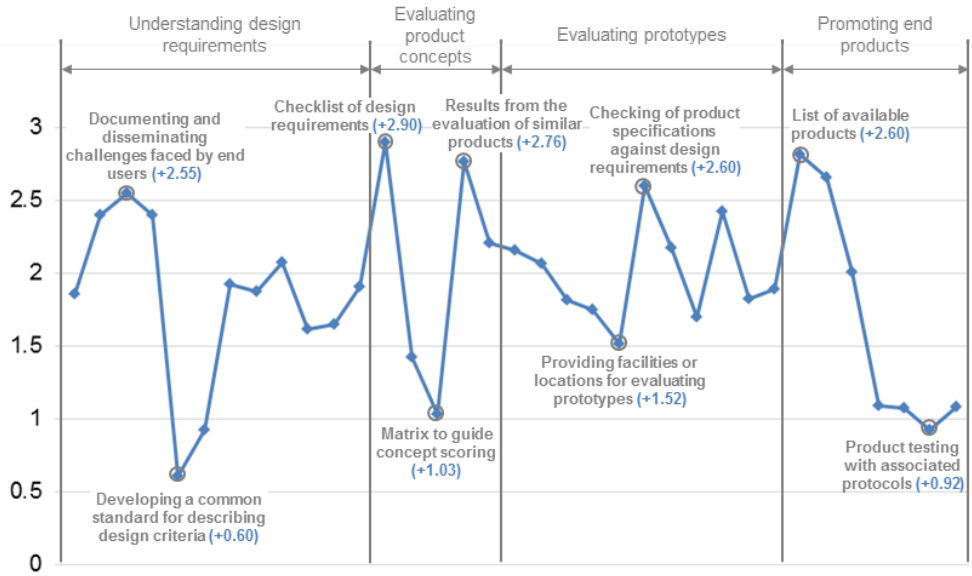

Figure 3. Mean combined response to each statement (Tools 1 – 35 not listed)

Table 1 summarises what the recommended tool would be if the recommendation were based on the following criteria: usefulness to suppliers and product developers; ease of implementation, and; combined usefulness and ease of implementation.

Table 1 Recommended tools based on various criteria

Stage	Usefulness	Ease of implementation	Combined
Overall	Field testing under emergency settings	List of available products	Checklist of design requirements
Understanding design requirements	Documenting and disseminating challenges faced by end users	Developing a design tool that includes design requirements and product components which fulfil them	Documenting and disseminating challenges faced by end users
Evaluating product concepts	Documentation of results from the evaluation of similar products	Checklist of design requirements	Checklist of design requirements
Evaluating prototypes	Field testing under emergency settings	Checking of product specifications against design requirements	Checking of product specifications against design requirements
Promoting end products	Product specifications of available products	List of available products	List of available products

Based on the combined mean scores, recommended tools would be (in order of score): a checklist of design requirements; documentation of results from the evaluation of similar products; list of available products; checking of product specifications against design requirements, and; documenting and disseminating challenges faced by end users. All these tools received combined mean scores of more than +2.50. Interestingly, the top two tools are from the "evaluating product concepts" category.

4. Discussion

The analysis demonstrates that, when considering how to better support suppliers and product developers, it is imperative to consider the practicality of implementing the

measures, regardless of how useful they may be. Field testing under emergency settings provides a good example, because it is considered very useful, yet somewhat difficult to implement. In this case, field testing under non-emergency settings or laboratory-based testing may be considered appropriate alternatives or complements.

Table 2 Least recommended tools based on various criteria

Stage	Usefulness	Ease of implementation	Combined
Overall	Developing a common standard for describing design criteria	Field testing under emergency settings	Developing a common standard for describing design criteria
Understanding design requirements	Developing a common standard for describing design criteria	Developing a common standard for describing design criteria	Developing a common standard for describing design criteria
Evaluating product concepts	Matrix to guide concept scoring (weighted)	Matrix to guide concept scoring (weighted)	Matrix to guide concept scoring (weighted)
Evaluating prototypes	Laboratory-based tests or experiments	Field testing under emergency settings	Providing facilities or locations for evaluating prototypes
Promoting end products	Enforcing a common standard for presenting product specifications	Enforcing product testing with associated protocols	Enforcing product testing with associated protocols

4.2 Limitations of the study

It is important to recognise that this was a relatively simplistic analysis of the 35 identified tools. There are several factors that affect the usefulness of a tool. First, different tools are useful for different purposes and under different circumstances. For example, laboratory experiments may be adequate for testing treatment efficiencies, but may not be suitable for determining whether a latrine is easy to set up and install. Second, how beneficial the tool is depends on how well the tool is implemented. For instance, documenting results from the evaluation of products can involve rigorous research methodologies or could just comprise the collection of informal feedback from a number of humanitarian practitioners. The ease of implementation of the tool also depends on the amount of funding and resources required, the degree to which structures and mind-sets within the humanitarian sector have to change, and so on.

These factors could not be comprehensively evaluated through this questionnaire. In addition, usefulness and ease of implementation were given equal weightage when combining both scores. However, the results provide a useful indication of the tools which stakeholders would find more useful when they develop emergency sanitation products and technologies.

5. Conclusion

In general, the study shows that there is a demand for tools to facilitate the product development process in terms of understanding of design requirements, evaluation of product concepts and evaluation of prototypes. However, it is also important to consider the feasibility of implementing these tools in practice. The study provides a valuable starting point to further research on understanding how useful and practical the identified tools would be to the product development process. It is hoped that the results will serve as a basis for discussion among stakeholders about how innovation in the emergency sanitation sector can be further supported.

Acknowledgements

This research was conducted under the project 'Stimulating local innovation on sanitation for the urban poor in sub-Saharan Africa and South-East Asia' financed by the Bill & Melinda Gates Foundation.

References

[1] Bastable A., Lamb, J., 2012. *Innovative designs and approaches in sanitation when responding to challenging and complex humanitarian contexts in urban areas*. Waterlines: Volume 31, Issue 1&2, Pages 67–82.

[2] Bastable A., Russell, L., 2013. Gap Analysis in Emergency Water, Sanitation and Hygiene Promotion. Oxfam GB and Humanitarian Innovation Fund, July 2013

[3] Department for International Development, 2011. Humanitarian emergency response review.

[4] Department for International Development, 2012. Promoting innovation and evidence-based approaches to building resilience and responding to humanitarian crises.

[5] Brown J., Cavill, S., Cumming O., Jeandron A., 2012. *Water, sanitation, and hygiene in emergencies: summary review and recommendations for further research*. Waterlines: Volume 31, Issue 1&2, Pages 11-29