THUYLOI UNIVERSITY

International Association of
Lowland Technology

BOOK OF PROGRAM & ABSTRACTS

International Symposium on Lowland Technology 2018

THINK GLOBALLY, ACT LOCALLY

September 26-28th, 2018, Hanoi, Vietnam

Geotechnical and Geoenvironmental Engineering
Water and Environmental Engineering
Coastal and Riverine Management
City Planning and Management

Editors: Nguyen Canh Thai - Nguyen Cao Don

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Editors: Nguyen Canh Thai; Nguyen Cao Don

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PREFACE

Lowlands are regions of low elevation, which are particularly vulnerable and susceptible to climatic, environmental changes and natural disasters. Actions are now required for the development of new technologies to protect and develop lowland regions. To achieve this aim, it is necessary to draw on and to merge several research disciplines, such as geoenvironment engineering, water resources management, coastal engineering and city planning for the advancement of lowlands.

The first International Symposium on Lowland Technology (ISLT) was held in 1998 and since then these international symposia have been held every two years. Earlier ten ISLT series were conducted in Japan [1998, 2000, 2002, 2006, 2010, 2014], Bangkok (Thailand) [2004], Busan (Korea) [2008], Bali (Indonesia) [2012], Mangalore (India) 2016. The 11th series ISLT 2018 with theme "working globally, acting locally" was held at Thuyloi University, Vietnam, during 26-28th, September, 2018.

The main objective of the Symposium is to bring together researchers and engineers working in lowland regions, from a broad range of disciplines, in order to present their research results, exchange information, facilitate networking, and to promote and advance technologies related to lowland development.

This printed abstracts book and eProceedings of ISLT 2018 provide a written record of the synergy that already exists between these research disciplines. Selected papers of the Symposium will be published in the journal of Lowland Technology International (ISSN: 1344-9656) indexed in Elsevier Geobase, Compendex® & Ei Backfile and Scopus.

Editor Team

How to Cite

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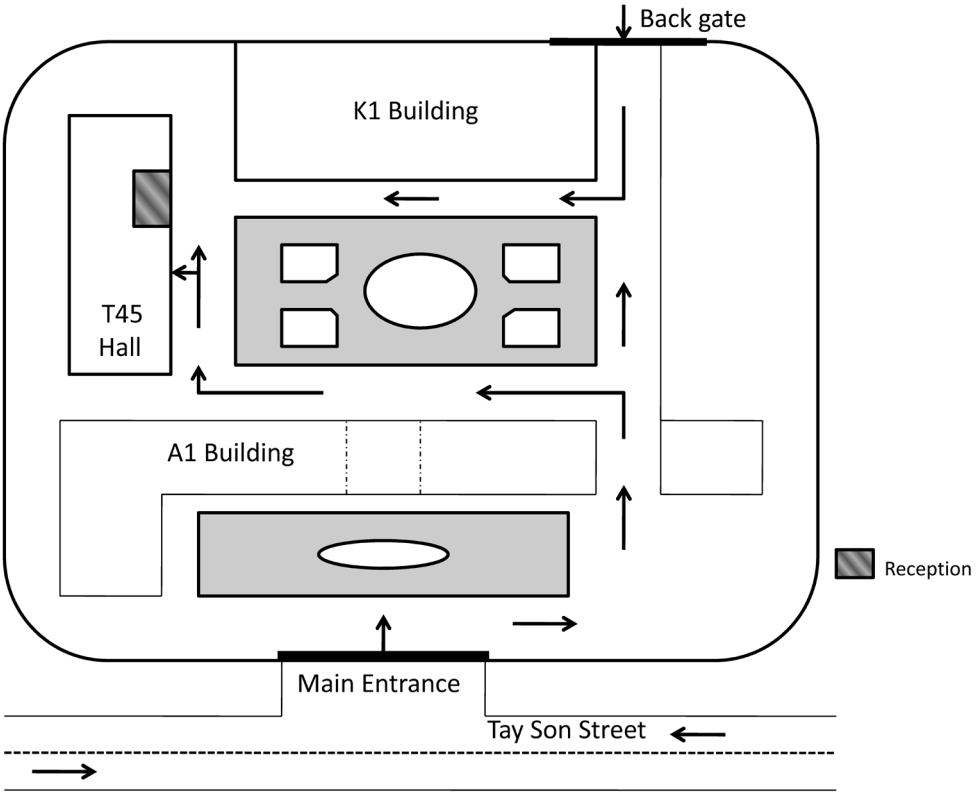
LAYOUT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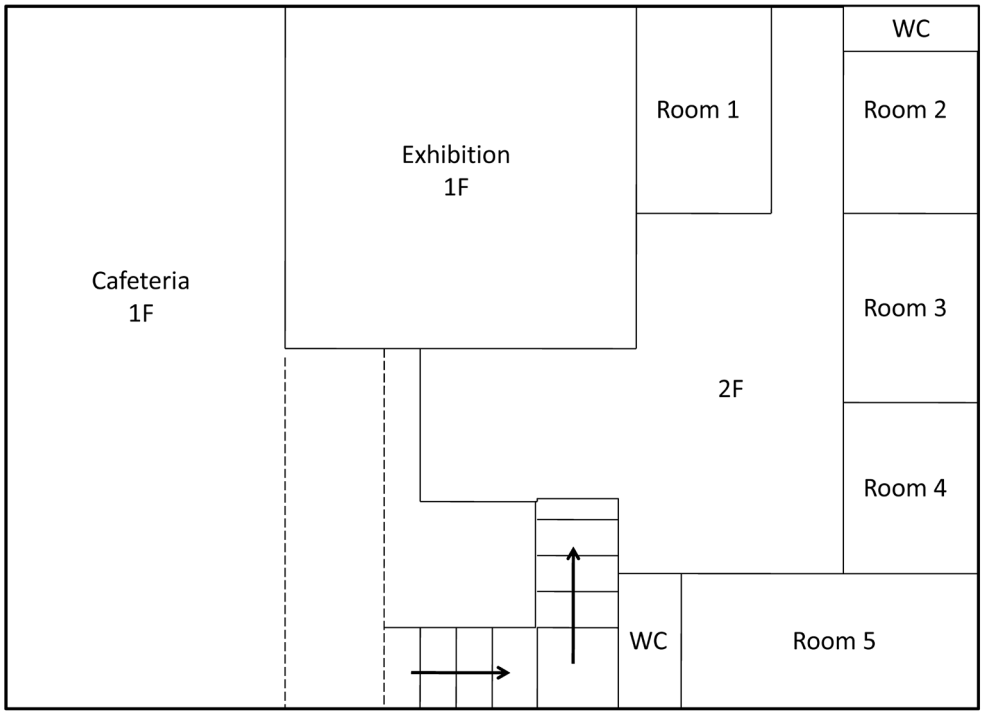
Tay Son Street

K1 BUILDING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WATER AND ENVIRONMENTAL ENGINEERING

CITY PLANNING AND MANAGEMENT

FINAL PROGRAM

Tuesday, 25 September 2018

From	To	Events	Room
15:30	17:00	Early coming registration and welcome drink	T45 Lobby

Wednesday, 26 September 2018

From	To	Events	Room
7:30	17:00	Registration and Reception	T45 Lobby
9:00	9:30	Opening Ceremony	T45 Hall
9:30	10:10	Keynote 1: *Waterside city* Prof. Sadao Watanabe - The University of Tokyo, Japan Chair person: Prof. Nguyen Canh Thai	T45 Hall
10:10	10:25	*Group photos*	T45 Hall
10:25	10:40	*Coffee break*	T45 Lobby
10:40	11:20	Keynote 2: *An Importance of Groundwater Flow System in the Sustainable Water Resources Management and Use* Prof. Maki Tsujimura - University of Tsukuba, Japan Chair person: Prof. Nguyen Canh Thai	T45 Hall
11:20	12:00	Keynote 3: *Engineering Properties, Problems and Stabilization of Lateritic Soils* Prof. Ramaiah Shivashankar - National Institute of Technology Karnataka, India Chair person: Prof. Nguyen Canh Thai	T45 Hall
12:00	13:30	*Lunch break*	Cafeteria, 1F, K1

From	To	Events	Room
13:30	14:00	"Geotechnical and geoenvironmental engineering" Session G1 *Keynote Lecture - Application of SDS and SD-sampler to survey on embankment improved by floating columns* Prof. Naoaki Suemasa - Tokyo City University, Japan	Room 5 - K1 Bld.
14:00	15:30	"Geotechnical and geoenvironmental engineering" Session G1	Room 5 - K1 Bld.
13:30	15:30	"Water and environmental engineering" Session W1	Room 1 - K1 Bld.
		"Water and environmental engineering" Session W2	Room 4 - K1 Bld.
		"Coastal and riverine management" Session C1	Room 2 - K1 Bld.
		"City planning and management" Session U1	Room 3 - K1 Bld.
15:30	15:45	*Coffee break*	1F, K1 Bld.
15:45	17:30	"Geotechnical and geoenvironmental engineering" Session G1	Room 5 - K1 Bld.
		"Water and environmental engineering" Session W1	Room 1 - K1 Bld.
		"Water and environmental engineering" Session W2	Room 4 - K1 Bld.
		"Coastal and riverine management" Session C1	Room 2 - K1 Bld.
		"City planning and management" Session U1	Room 3 - K1 Bld.
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Thursday, 27 September 2018

From	To	Events	Room
7:30	17:00	Registration	
8:00	8:30	"Geotechnical and geoenvironmental engineering" Session: *Keynote Lecture - The failure of road embankment along the irrigation canal in the soft clay subsoil from prolong drought and mitigation schemes* Prof. Suttisak Soralump - Kasetsart University	Room 5 - K1 Bld.
8:30	9:45	"Geotechnical and geoenvironmental engineering" Session G1	Room 5 - K1 Bld.
8:00	8:30	"Water and environmental engineering" and "Coastal and riverine management" Sessions: *Keynote Lecture - The application of flash flood guidance system for early risk warning in mountainous regions of northern Vietnam* Dr. Hoang Duc Cuong - Vietnam Meteorological and Hydrological Administration	Room 1 - K1 Bld.
8:30	9:45	"Water and environmental engineering" Session W1	Room 1 - K1 Bld.
		"Water and environmental engineering" Session W2	Room 3 - K1 Bld.
8:30	9:45	"Coastal and riverine management" Session C1	Room 2 - K1 Bld.
8:00	8:30	"City planning and management" Session U1 *Keynote Lecture - Water surface system in rural area, change and transformation, problems, local movement in the context of urbanization and climate change* Dr. Le Quynh Chi - National University of Civil Engineering, Vietnam	Room 4 - K1 Bld.
8:30	9:45	"City planning and management" Session U1	
9:45	10:00	*Coffee break*	1F & 2F, K1 Bld.
10:00	12:00	"Geotechnical and geoenvironmental engineering" Session G1	Room 5 - K1 Bld.
		"Water and environmental engineering" Session W1	Room 1 - K1 Bld.
		"Water and environmental engineering" Session W2	Room 3 - K1 Bld.
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From	To	Events	Room
12:00	13:30	*Lunch break*	Cafeteria, 1F, K1
13:30	15:30	"Geotechnical and geoenvironmental engineering" Session G1	Room 5 - K1 Bld.
13:30	15:30	"Water and environmental engineering" Session W1	Room 1 - K1 Bld.
		"Water and environmental engineering" Session W2	Room 3 - K1 Bld.
15:30	15:45	*Coffee break*	1F, K1 Bld.
15:45	17:00	"Geotechnical and geoenvironmental engineering" Session G1	Room 5 - K1 Bld.
		"Water and environmental engineering" Session W1	Room 1 - K1 Bld.
		"Water and environmental engineering" Session W2	Room 3 - K1 Bld.
17:05	17:45	Closing ceremony	T45 Hall
18:30	21:00	Gala Dinner at Maison Sen Tay Ho	Masion Sen Tay Ho

Friday, 28 September 2018: Post-conference tour

From	To	Events
6:30	7:00	Participants garthering at the main gate of Thuyloi University
7:00	10:30	Departure for Xuan Thuy National Park
10:30	11:30	Introduction to the Park by the Management Board
11:30	15:00	Visit to the Vop River, mangrove forest, Ba Lat estuary, etc., by boat; having lunch onsite
15:00	18:30	Departure for Thuyloi University

Wednesday, 26 September 2018

SESSION G1: GEOTECHNICAL AND GEO-ENVIRONMENTAL ENGINEERING

Room 5 - K1 Building

From	To	Chair person: Prof. Ramaiah Shivashankar; Dr. Pham Quang Tu
13:30	14:00	"Geotechnical and geoenvironmental engineering" Session G1 *Keynote Lecture - Application of SDS and SD-sampler to survey on embankment improved by floating columns* Prof. Naoaki Suemasa - Tokyo City University, Japan
14:00	14:15	SOIL RESISTIVITY STUDIES RELATED TO CORROSIVE NATURE OF LATERITIC SOILS FOR BURIED PIPES R. Shivashankar, Nimi Ann Vincent, Divya Nath and K. N. Lokesh
14:15	14:30	EFFECT OF RBI GRADE 81 STABILIZER ON PAVEMENTS IN LOWLAND AREAS AND HEAVY RAINFALL AREAS A.U. Ravi Shankar, Amulya S. and Panditharadhya B.J.
14:30	14:45	STRENGTH AND MICROSTRCUTURE ASSESSMENT OF RECYCLED ASPHALT PAVEMENT - SLAG GEOPOLYMER AS A ROAD MATERIAL M. Hoy, S. Horpibulsuk and A. Arulrajah
14:45	15:00	BEARING CAPACITY OF RING FOOTING ON REINFORCED FOUNDATION BED OVER SOFT GROUND K. Rajyalakshmi, V.A. Sakleshpur and M.R. Madhav
15:00	15:15	THE INVESTIGATION ON COLLAPSED RIVERBANK PROTECTION STRUCTURE AND REMEDIAL APPROACH A. Udcomchai, M. Hoy, S. Horpibulsuk and A. Chinkulkijiniwat
15:15	15:30	MECHANISM OF INTERNAL INSTABILITY OR SUFFUSION OF COHESIONLESS SOILS: SELF-FILTERING CRITERIA AND STRESS TRANSMITTING BETWEEN PRIMARY AND LOOSE PORTIONS V.T. Nguyen and T.T.G. Vo
15:30	15:45	*Coffee break*

From	To	Chair person: Prof. Ramaiah Shivashankar; Dr. Pham Quang Tu
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16:00	16:15	NUMERICAL ANALYSES OF SETTLEMENT AND STABILITY OF BRIDGE APPROACH BUILT ON EXPENDED POLYSTYRENE (EPS) Nguyen Chau Lan, Hoang Anh Van and Truong Quang Manh
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16:30	16:45	SEISMIC RESPONSE OF GEOGRID REINFORCED PILED EMBANKMENT SLOPES B. R. Jayalekshmi, Radhika M Patel and R. Shivashankar
16:45	17:00	ANALYSIS OF HIGH VOLUME ROADS DURING HEAVY MONSOON IN COASTAL AND LOW LAND AREAS Ravi Shankar A. U, Priyanka B. A and Padma Tejaswi S
17:00	17:15	UTILIZING DEEP NEURAL NETWORKS TO PREDICT SHIELD TUNNELING-INDUCED GROUND SETTLEMENTS Kun Zhang, Shui-Long Shen and Ye-Shuang Xu
17:15	17:30	DESIGN METHOD FOR STEEL ROTATION PILE FOUNDATION IN VIETNAM Dao Duy Lam and Nguyen Thi Tuyet Trinh

Thursday, 27 September 2018

SESSION G1: GEOTECHNICAL AND GEO-ENVIRONMENTAL ENGINEERING

Room 5 - K1 Building

From	To	Chair person: Prof. Suttisak Soralump; Dr. Tran The Viet
8:00	8:30	"Geotechnical and geoenvironmental engineering" Sessions: *Keynote Lecture - The failure of road embankment along the irrigation canal in the soft clay subsoil from prolong drought and mitigation schemes* Prof. Suttisak Soralump - Kasetsart University
8:30	8:45	SOIL TYPE, RAINFALL INFILTRATION AND THE STABILITY OF UNSATURATED CUT-SLOPES T. The Viet, P. Huy Dung, H. Viet Hung and T. Minh Thu
8:45	9:00	APPLICATION OF SIMPLE DRAINAGE BY SIPHON WATER-LEADING HOSE TO COHESIVE SOIL K. Shiraishi, K. Omine, S. Sugimoto, Z. Zhang and K. Nakahara
9:15	9:30	LIQUEFACTION EXPANSION CAUSED BY FORESHOCKS AND MAIN SHOCKS OF JAPAN'S 2016 KUMAMOTO EARTHQUAKE R. Hirata, S. Murakami and H. Nomiyama
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9:00	9:15	EXPERIMENTAL STUDIES ON THE EFFECTS OF SIZE OF SAMPLE ON CONSOLIDATION CHARACTERISTIC OF SOILS Le Ba Vinh and Phu Nhat Truyen
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10:00	10:15	SLOPE STABILITY ANALYSIS FOR MULTIPLE SLIDING MASS Sy Huu Pham, Vinh Phu Pham and Minh Le Vu
10:15	10:30	ADHESION RESISTANCE BETWEEN SOIL CEMENT COLUMN AND REINFORCED MATERIALS I. Meepon and P. Voottipruex
10:30	10:45	DETERMINING THE EFFECTIVE STRESS FIELD IN SOIL ACCORDING TO THE SHEAR POTENTIAL D. Thang

10:45	11:00	USING DENITRIFICATION TO MICROBIALLY REDUCE WATER SATURATION FOR SOIL IMPROVEMENT Vinh P. Pham, A. Nakano, L.A. van Paassen and W.R.L. van der Star
11:00	11:15	PHYTO-FENTON PROCESS FOR THE REMEDIATION OF ORGANOCHLORINE PESTICIDES-CONTAMINATED SOILS T. Dinh Trinh
11:15	11:30	DEFORMATION AND PERMEABILITY CHARACTERISTIC OF CEMENT-TREATED SOILS Le Ba Vinh, Nguyen Tan Bao Long and Dinh Huu Dung
11:30	11:45	DETERMINATION OF THE CBR VALUE OF THE CLAY SOIL BASED ON ENERGY OF THE RIC ELECTRO-MECHANICAL SYSTEM MODEL Arifin Beddu, Lawalenna Samang, Tri Harianto and Achmad Bakri Muhiddin
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16:45	17:00	CALCULATE THE TREATMENT OF THE ROAD AFTER BRIDGE ABUTMENT USING BAMBOO PILE REINFORCED GEOTEXTILE D. Huu Dao, N. Van Hai and P. Khac Hai

Wednesday, 26 September 2018

SESSION W1: WATER AND ENVIRONMENTAL ENGINEERING

Room 1 - K1 Building

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From	To	Chair person: Prof. Nguyen Thu Hien; Assoc. Prof. Ngo Van Quan
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Wednesday, 26 September 2018

SESSION W2: WATER AND ENVIRONMENTAL ENGINEERING

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15:00	15:15	LOW-COST ADSORBENT MATERIAL MODIFIED FROM RED MUD FOR REMOVAL OF LEAD FROM AQUEOUS SOLUTION P. Thi Hong, P. Nguyet Anh and D. Thi Thu Huyen
15:15	15:30	EVALUATION ABILITY OF MYCOFILTRATION TO TREAT AQUACULTURE WASTE WATER Tan T. Thai and Hoa T. Pham
15:30	15:45	*Coffee break*

From	To	Chair person: Prof. Mohan Kumar; Assoc. Prof. Bui Quoc Lap
15:45	16:00	PARAMETER SENSITIVITY ANALYSIS FOR A COASTAL PHREATIC AQUIFER B.N. Priyanka and M.S. Mohan Kumar
16:00	16:15	APPLICATION OF A 3D MODEL TO STUDY ON SEDIMENT TRANSPORT IN THE DONG NAI RIVER IN BIEN HOA DISTRICT L. Minh Nguyet, Jaya Kandasamy, D. Quang Minh and P. Thi Huong Lan
16:15	16:30	A DEEP NEURAL NETWORK APPLICATION FOR FORECASTING THE INFLOW INTO THE HOABINH RESERVOIR IN VIETNAM Le Xuan Hien, Hung Viet Ho, Giha Lee and Sungho Jung
16:30	16:45	IMPACT OF SEASONAL OPERATION BY WASTEWATER TREATMENT PLANT ON WATER QUALITY OF COSTAL WATER AREA
16:45	17:00	DISSIPATION HALF-LIFE OF PROPICONAZOLE IN WATER AND ITS REMOVAL EFFICIENCY BY HORIZONTAL SUBSURFACE FLOW CONSTRUCTED WETLAND P. Van Toan and L. Hoang Viet
17:00	17:15	ANALYSIS OF THE CURRENT STATUS OF WATER QUALITY AND CAPACITY TO SUPPLY WATER TO THE INNER RIVERS OF HANOI CITY N. Huu Hue and N. Huu Thanh
17:15	17:30	OPTIMIZATION OF HETEROGENEOUS ELECTRO FENTON PROCESS FOR PESTICIDE WASTEWATER TREATMENT Nguyen Duc Dat Duc, Nguyen Thi Chi Nhan, Nguyen Huynh Thang and Nguyen Tan Phong

Thursday, 27 September 2018

SESSION W1: WATER AND ENVIRONMENTAL ENGINEERING

Room 1 - K1 Building

From	To	Chair person: Prof. B.R. Jayalekshmi; Dr. Dang Minh Hai
8:00	8:30	"Water and environmental engineering" and "Coastal and riverine management" Sessions: *Keynote Lecture - The application of flash flood guidance system for early risk warning in mountainous regions of northern Vietnam* Dr. Hoang Duc Cuong - Vietnam Meteorological and Hydrological Administration
8:30	8:45	ESTABLISH LANDSLIDE SUSCEPTIBILITY MAPPING IN SON LA PROVINCE, VIETNAM BY USING GEOGRAPHY INFORMATION SYSTEM AND ANALYTICAL HIERARCHY PROCESS Nguyen Cam Van and Lai Tuan Anh
8:45	9:00	LONG-TERM ANALYSIS OF WATER QUALITY IN THE TERAUCHI RESERVOIR AND DISCHARGED LOADING FROM ITS CATCHMENT AREA N. Vongthanasunthorn, H. Sasaki, K. Koga and T. Abe
9:00	9:15	FLOOD RISK ASSESSMENT IN THE TRA BONG RIVER CATCHMENT, VIETNAM Trinh. X. M, Nguyen Mai Dang and Molkenthin. F
9:15	9:30	ASSESSING THE SPATIAL DISTRIBUTION OF RIVER WATER QUALITY IN THE CAN GIO MANGROVE FOREST V. Thi Hoai Thu, T. Tabata, K. Hiramatsu, T. Anh Ngoc and M. Harada
9:30	9:45	REGIONAL DROUGHT MONITORING AND ANALYZING USING LANDSAT 8 DATA - A CASE STUDY IN NINH THUAN AND BINH THUAN PROVINCES IN 2016 Nguyen Ho Phuong Thao, Roberto RANZI, Hoang Thanh Tung and Nguyen Hoang Son
9:45	10:00	*Coffee break*
From	**To**	**Chair person: Prof. B.R. Jayalekshmi; Dr. Dang Minh Hai**
10:00	10:15	RESEARCH ON CONTRIBUTION RATIO OF LARGE UPSTREAM RESERVOIRS FOR MINIMUM FLOW IN VUGIA-THUBON RIVER SYSTEM To Viet Thang, Ngo Le Long, Nguyen Tung Phong and Nguyen Thi Thu Nga
10:15	10:30	ASSESSMENT OF WATER SHORTAGE IN SESAN RIVER BASIN BY INTEGRATING THE SWAT AND WEAP MODELS Xuan Khanh Do, Hoa Nguyen Thi and Kim Chau Tran

10:30	10:45	CROWDSOURCING AND APPLICATION IN CRISIS MANAGEMENT IN VIETNAM L. Nguyen Tuan Thanh
10:45	11:00	DEVELOPMENT OF A HYDRO-ECONOMIC MODEL FOR OPTIMIZING WATER ALLOCATION IN BA RIVER BASIN Nguyen Thi Thu Nga
11:00	11:15	THE COMPUTATION OF HYDRAULIC CHARACTERISTICS OF FLOOD FLOW DOWNSTREAM FROM THE RESERVOIR WITH DAM SAFETY SCENARIOS IN NORTH VIETNAM Le Thi Thu Hien and Hung Viet Ho
11:15	11:30	NUMERICAL MODELLING OF FLOW IN THE TONLE SAP BY MEANS OF A DISCONTINUOUS GALERKIN FINITE-ELEMENT MODEL Hoang-Anh Le, Chien Pham Van, Huyen Xuan Vu Dang, Jonathan Lambrechts, Sigrun Ortleb, Nicolas Gratiot, Sandra Soares-Frazao and Eric Deleersnijder
11:30	11:45	A STUDY ON THE WATERSHEDS' CHARACTERISTICS AND INFLUENCE FACTORS OF THE 2017 NORTHERN KYUSHU TORRENTIAL RAIN DISASTER K. Ohgushi, S. Satoh, H. Tsuji, T. Morita and M. A. Achyadi
11:45	12:00	UNDERGROUND WATER RECHARGE MODEL FOR CENTRAL AND CENTRAL HIGLAND OF VIET NAM Nguyen Quoc Dung, Phan Viet Dung and Phan Truong Giang
12:00	13:30	*Lunch break*
From	**To**	**Chair person: Prof. Narumol Vongthanasunthorn; Dr. Dang Minh Hai**
13:30	13:45	CONTRIBUTION OF INDIGENOUS KNOWLEDGE TO ADAPT TO FLOODS IN MEKONG DELTA, VIETNAM P. Xuan Phu, N. Ngoc De and N. Thuy Bao Tran
13:45	14:00	DEVELOPMENT OF LINER SYSTEM IN LANDFILL SITE USING HYBRID ADSORBENT Ye Zin Naing, S. Juengjarenniration, H. Araki and Y. Mishima and M. Ohno
14:00	14:15	GROUNDWATER QUALITY AND HUMAN HEALTH RISK RELATED TO GROUNDWATER CONSUMPTION IN AN GIANG PROVINCE P. Kim Anh and N. Thanh Giao
14:15	14:30	RESEARCH ON WATER ACCUMULATION OPERATING MODES IN FLOOD SEASON FOR HOA BINH AND SON LA CASCADE HYDROPOWER RESERVOIRS Vu Thi Minh Hue

14:30	14:45	DESIGNING FLOOD HAZARD MAPPING FOR DISASTER RISK MANAGEMENT - A CASE STUDY IN VU GIA - THU BON RIVER BASIN Truong Van Anh, Luca Dutto, Duong Anh Quan, Alfio Bernado and Pham Xuan Duc
14:45	15:00	FLOOD RISK ASSESSMENT UNDER THE IMPACT OF HYDROPOWER PLANT RESERVOIR OPERATION. A CASE STUDY AT DOWNSTREAM OF VUGIA THUBON RIVER SYSTEM, VIETNAM N.D Vo, T.H Nguyen and P. Gourbesville
15:00	15:15	IMPACT OF AQUATIC RESOURCES ON LIVELIHOOD OF THE PEOPLE LOWER MEKONG BASIN P. Xuan Phu and N. Thuy Bao Tran
15:15	15:30	ADSORPTION OF CADMIUM(II) FROM AQUEOUS SOLUTION IN FIXED BED COLUMN USING COCKLE SHELL (ANADARA GRANOSA) POWDER C.-H. Nhan, T.-A. Nguyen and T.-A.-N. Nguyen
15:30	15:45	*Coffee break*
From	**To**	**Chair person: Prof. Narumol Vongthanasunthorn; Dr. Dang Minh Hai**
15:45	16:00	RESEARCH ON POLLUTION OF POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) FROM WATER AND SEDIMENT OF CAUBAY RIVER, HANOI V. Duc Toan
16:00	16:15	ESTIMATION OF FLOOD PROBABILITY IN HANOI USING STANDARD MONTE CARLO SIMULATION AND SUBSET SIMULATION Quang Dinh and L. Van Thinh
16:15	16:30	STORM WATER DRAINAGE REQUIREMENT OF BAC-NAM-HA LOWLAND AREA UNDER CLIMATE CHANGE SCENARIOS L. Duc Dung, N. Tuan Anh and L. Van Chin
16:30	16:45	WATER QUALITY OF HOA BINH RESERVOIR Nguyen Kien Dzung and Doan Quang Tri
16:45	17:00	STREAMFLOW EXTENTION USING MIKE NAM MODEL FOR BANG GIANG - KY CUNG RIVER BASIN OF VIETNAM Hung M. Le, Manh T. Phan, Minh V. Nguyen and Nguyen Cao Don

Thursday, 27 September 2018

SESSION W2: WATER AND ENVIRONMENTAL ENGINEERING

Room 3 - K1 Building

From	To	Chair person: Prof. Koicihro Ohgushi; Dr. Pham Van Chien
8:30	8:45	SEDIMENT YIELD IN DA RIVER BASIN AND SEDIMENT FLOW IN HOA BINH RESERVOIR Nguyen Kien Dzung and Doan Quang Tri
8:45	9:00	ANALYSIS OF RAINFALL CHARACTERISTICS IN SAGA CITY USING RAINFALL INTENSITY FORMULA K. Eto, Y. Mishima and H. Araki
9:00	9:15	FLOOD SIMULATIONS FOR BAGO RIVER BASIN USING IFAS Su Wai Thin, Win Win Zin and K. Ohgushi
9:15	9:30	STUDY OF ON ENERGY DISSIPATION PERFORMANCE THROUGH SIDE WALL OF STILLING BASIN T. Vinh Cuong, G. Thu, P. Anh Tuan, N. Viet Hung and N. Thanh Khoi
9:30	9:45	METAL POLLUTION IN HANOI LAKES AND THE BIOACCUMULATION IN FISH SPECIES P. Thi Hong, D. Van Khuong and H. Thi Thu Huong
9:45	10:00	*Coffee break*
From	**To**	**Chair person: Prof. Koicihro Ohgushi; Dr. Pham Van Chien**
10:00	10:15	WATER QUALITY MODELLING FOR TOTAL MAXIMUM DAILY LOADS CALCULATION IN NHUE - DAY RIVER Nguyen Duy Binh and Hoang Cong Huy
10:15	10:30	MODELING WATER FLOWS IN THE BAC HUNG HAI IRRIGATION SYSTEM Chien Pham Van, Giang Nguyen-Van, Nguyen Thi Van, Le Van Chin, Doanh Nguyen-Ngoc and Drogoul Alexis
10:30	10:45	ASSESSING THE IMPACTS OF LAND USE CHANGE ON WATER FLOW IN SESAN RIVER BASIN L. Minh Nguyet, H. Thanh Tung, N. Hoang Son and Vu Hoai Thu
10:45	11:00	THE LIVELIHOOD VULNERABILITY TO FLOODS IN FULL-DYKE SYSTEM IN CHO MOI DISTRICT, AN GIANG PROVINCE N. Ngoc Diep, T. Thi Le Hang, N. Xuan Thinh and V. Pham Dang Tri

11:00	11:15	DESIGN FLOOD ESTIMATION IN THE CONTEXT OF CLIMATE CHANGE - A CASE STUDY IN THE SOUTH CENTRAL AND HIGHLAND PROVINCE L. Thi Hai Yen, N. Le An, N. Le Long and N. Thi Thu Ha
11:15	11:30	ASSESSMENT OF THE IMPACT OF FERTILIZER APPLICATION ON NITROGEN LOAD USING SWAT MODEL: A CASE STUDY IN BAC DUONG IRRIGATION SYSTEM, VIET NAM MH. Dang and MD. Nguyen
11:30	11:45	CLIMATE CHANGE IMPACT ASSESSMENT ON STREAM FLOW OF LAIGIANG RIVER, VIETNAM N.D Vo
11:45	12:00	APPLICATION OF SWAT AND IQQM MODELS FOR WATER DEMAND ASSESSMENT IN THE XEDONE BASIN OF LAO Khamla Phomsavath, Le Van Uoc and Nguyen Cao Don
12:00	13:30	*Lunch break*
From	**To**	**Chair person: Assoc. Prof. Nguyen Mai Dang; Dr. Dang Minh Hai**
13:30	13:45	LINKING VIETNAM FOREST TENURE POLICY ASSESSMENT TO SUSTAINABLE FOREST MANAGEMENT, LIVELIHOODS, ANDCLIMATE CHANGE MITIGATION Tuyet Anh T. Le, Jianghua Wu, Kelly Vodden, Son L. Hoang, Quy V. Khuc and Hung T. Nguyen
13:45	14:00	APPLICATION OF ISIS MODEL FOR FLOOD CONTROL IN THE XEDONE BASIN OF LAO COUNTRY Khamla Phomsavath, Le Van Uoc and Nguyen Cao Don
14:00	14:15	NUMERICAL STUDY OF THE CHANGE OF FLOW IN VAM-NAO RIVER DUE TO LEVEE SYSTEM IN MEKONG DELTA T.T.T. Nguyen, T.M.H. Tran and G. Le Song
14:15	14:30	EVALUATION OF TRMM MULTI-SATELLITE PRECIPITATION ANALYSIS (TMPA) PRODUCT (3B42) OVER INDONESIA (1998-2017) N. Helda, A. Kilic, F. Munoz-Arriola and R. G. Allen
14:30	14:45	AN ASSESSMENT OF AGRICULTURAL PRODUCTIVITY IN THE UP STREAM OF THE VIET-NAMESE MEKONG DELTA UNDER WATER RESOURCES CHANGE N. Le Trang, N. Ngoc Diep and V. Pham Dang Tri
14:45	15:00	EVALUATION THE IMPACT OF CLIMATE CHANGES ON STREAM DISCHAGE AND PREDICT-ING DROUGHT, FLOOD IN CAU RIVER WATERSHED, NORTHERN VIETNAM Phan Dinh Binh, Nguyen Thanh Hai, Nguyen Ngoc Anh and Nguyen Quang Thi

15:15	15:30	REMOVAL OF METHYLENE BLUE FROM AQUEOUS SOLUTIONS BY FIXED-BED COLUMN ADSORPTION USING SUGARCANE BAGASSE AS ADSORBENT C.-S. Nguyen-Phung, T.-A. Nguyen and T.-A.-N. Nguyen
15:00	15:15	
15:30	15:45	*Coffee break*
From	**To**	**Chair person: Dr. Doan Quang Tri; Dr. Dang Minh Hai**
15:45	16:00	REMOVAL OF HEAVY METAL IONS IN SLUDGE BY MAGNETIC CHITOSAN MATERIAL Pham Thi Ngoc Lan and Le Thi My Hanh
16:00	16:15	CURRENT STATE OF DOMESTIC WATER CONSUMPTION AND FEASIBILITY OF IMPLEMENTING RAINWATER HARVESTING SYSTEM IN THE VINH CHAU TOWN, SOC TRANG PROVINCE N. Ngoc Diep, T. Thi Le Hang, van der Heiden Dion, D. Diep Anh Tuan and V. Pham Dang Tri
16:15	16:30	IMPACT OF LOWER WATER LEVEL OF THE RED RIVER ON WATER IRRIGATION CAPACITY OF BAC-HUNG-HAI IRRIGATION SYSTEM L. Van Chin, N. Tuan Anh and V. Trong Bang
16:30	16:45	REMOVAL OF COPPER FROM AQUEOUS WATER BY ELECTROCOAGULATION USING ALUMINIUM ELECTRODES: APPLICATION OF BOX- BEHNKEN DESIGN FOR THE OPTIMIZATION AND CHARACTERISTIC SLUDGE N. Thanh Hoa, N.Thi Hien, L. Thi Huong, N. Quang Hung and N. Thuy Ninh
16:45	17:00	EXISTING EMERGENCY SPILLWAYS AND APPLICATIONS OF PROBABILITY THEORY TO RESERVOIRS Nguyen Lan Huong and Pham Ngoc Quy

Wednesday, 26 September 2018

SESSION C1: COASTAL AND RIVERINE MANAGEMENT

Room 2 - K1 Building

From	To	Chair person: Prof. Tsung-Yi Lin; Assoc. Prof. Le Hai Trung
13:30	13:45	COASTAL PROTECTION PLAN FOR THE MEKONG DELTA (CPP) Roman Sorgenfrei
13:45	14:00	THE USE OF LANDSAT IMAGE IN MONITORING THE SHORELINE CHANGE IN THANH DA PENINSULA FROM 1991 TO 2017 Ho Quang Hai and Nguyen Thanh Ngan
14:00	14:15	ASSESSMENT AND PREDICTION OF THE RISK OF OIL SPILL FROM WATER TRAFFIC AT SON TRA MARINE PARK - THO QUANG WARD, SON TRA DISTRICT, DA NANG CITY Ngo Tra Mai and Vu Hoang Hoa
14:15	14:30	RELATION BETWEEN LONG-TERM VARIATION OF SUMMER-TIME WAVES AND CLIMATE CHARACTERISTICS ALONG THE SEA OF JAPAN COAST Nguyen Trinh Chung and Masatoshi Yuhi
14:30	14:45	RESEARCH ON SOLUTION TO PREVENT SEDIMENTATION OF TAM QUAN ESTUARY, BINH DINH PROVINCE Tr. Thanh Tung and Ng.Quang Chien
14:45	15:00	MOVING BOUNDARY TECHNIQUE FOR TWO-DIMENSIONAL FINITE ELEMENT MODEL, WITH APPLICATION FOR SIMULATING INUNDATION PROCESSES IN THE LOWLAND AREAS OF THE MEKONG RIVER SYSTEM Chien Pham Van and Pham Thanh Hai
15:00	15:15	THREAT OF COASTAL HAZARDS TO SOCIO-ECONOMIC DEVELOPMENT IN THE CENTRAL COASTS OF VIETNAM Phu L. Vo, T-Y. Lin and Bao G. Nguyen
15:15	15:30	SALT INTRUSION MODELLING AND PREDICTION USING MIKE - SWAT - GIS TOOLS: CASE OF THE VE RIVER ESTUARY, QUANG NGAI Diep Thi My Le, Anh Huynh Bui, Khanh Thi Phi Ho and Long Ta Bui
15:30	15:45	*Coffee break*

From	To	Chair person: Prof. Tran Thanh Tung; Assoc. Prof. Le Hai Trung
15:45	16:00	APPLYING GIS AND RS IN ASSESSING THE SHORELINE CHANGE IN HON DAT DISTRICT FROM 1989 TO 2017 Nguyen Thanh Ngan
16:00	16:15	ESTIMATING COASTAL WATER QUALITY IN DANANG BAY, VIETNAM: MODEL DEVELOPMENT AND PARAMETER ASSESSMENT Nhi Kha Dang, Diep Thi My Le, Khanh Thi Phi Ho and Long Ta Bui
16:15	16:30	EFFECTS OF SPUR DIKES SPATIAL LAYOUT TO RIVER BED EVOLUTION IN TIDAL RIVER T. Vinh Cuong, N. Thanh Hung, V. Thanh Te and P. Anh Tuan
16:30	16:45	PERFORMANCE OF EROSION RESISTANCE OF COMPACTED CEMENT MIXED CLAYEY SOIL Tetsuro Inoue, Daisuke Suetsugu, Yoshikuni Akiyama, Kazuki Matsumura and Katsuyuki Sakamaki
16:45	17:00	CALIBRATION OF TWO-DIMENSIONAL FLOODPLAIN MODELING USING SATELLITE DATA, A CASE STUDY FOR THE THACH HAN RIVER, QUANG TRI, VIET NAM N. Hoang Son and H. Thanh Tung
17:00	17:15	LITERATURE REVIEW ON THE MODELING OF PROCESSES RELATED TO SEADIKE TOE EROSION DURING STORMS Nguyen Thi Phuong Thao

Thursday, 27 September 2018

SESSION C1: COASTAL AND RIVERINE MANAGEMENT

Room 2 - K1 Building

From	To	Chair person: Prof. Vu Minh Cat; Assoc. Prof. Mai Van Cong
8:00	8:30	"Water and environmental engineering" and "Coastal and riverine management" Sessions: *Keynote Lecture - The application of flash flood guidance system for early risk warning in mountainous regions of northern Vietnam* Dr. Hoang Duc Cuong - Vietnam Meteorological and Hydrological Administration Room 1 - K1 Bld.
8:30	8:45	WAVE REDUCTION BY A BAMBOO FENCE Ngo Thi Thuy Anh, Mai Cao Tri and Mai Van Cong
8:45	9:00	APPLICATION NUMERICAL WAVE CHANNEL STUDY OF WAVE AND DETACHED BREAK-WATER INTERACTION IN BA LANG BEACH, NHA TRANG COAST N. Viet Thanh, N. Van Thin, P. Dang Hieu, N. Thi Hai Ly, N. Trung Viet and V. Minh Tuan
9:00	9:15	INFLUENCES OF MANMADE STRUCTURES ON STORM SURGE FLOODING Nghiem Tien Lam
9:15	9:30	SPATIO-TEMPORAL TRENDS OF EXTREME RAINFALL AT A SUB-BASIN SCALE OF THIVAI RIVER IN SOUTHERN VIETNAM N. Tien Thanh
9:30	9:45	
9:45	10:00	*Coffee break*

From	To	Chair person: Prof. Nghiem Tien Lam; Assoc. Prof. Mai Van Cong
10:00	10:15	LONGSHORE SEDIMENT TRANSPORT VARIATIONS ON A MESOTIDAL SANDY BEACH Jaya Kumar Seelam, Yadhunath E.M and Jishad M
10:15	10:30	A NEW APPROACH FOR GENERATING CONTOUR LINES OF BIVARIATE EXCEEDANCE PROBABILITY: APPLICATION TO HYDROLOGY Ngoc Hieu Dao, Earl Bardsley and Varvara Vetrova
10:30	10:45	APPLICATION OF REMOTE SENSING AND GIS TO STUDY THE EVOLUTION OF RED RIVER DELTA COASTLINES FROM DO SON TO NGHIA HUNG DURING PERIOD 2005 - 2015 Vu Minh Cat and Vu Minh Anh
10:45	11:00	AN ANALYSIS OF HISTORICAL BEACH EROSION ALONG THE CENTRAL COAST OF VIETNAM Hai Trung Le, Cam Van Nguyen, Tuan Hai Le and Thanh-Tung Tran
11:00	11:15	STUDY EFFECTS OF DECK THICKNESS OF JETTY ON THE INTERNAL FORCE DISTRIBUTION OF PILES UNDER WAVE FORCE T. Long Giang

Wednesday, 26 September 2018

SESSION U1: CITY PLANNING AND MANAGEMENT

Room 3 - K1 Building

From	To	Chair person: Prof. Hoang Vinh Hung; Assoc. Doan Thu Ha
13:30	14:00	EXAMINING THE LAND USE-TRANSPORTATION ACCESSIBILITY BY COMPARING BETWEENNESS CENTRALITY PARAMETERS Somsiri Siewwuttanagul, Takuro Inohae and Nobuo Mishima
14:00	14:15	EXPLORING LAND USE IMPACT ON ITS SURROUNDING AREA OF UNIVERSITY AND TOWNS: A CASE STUDY OF CHIANG MAI UNIVERSITY, THAILAND Umpiga Shummadtayar and Charnarong Srisuwan
14:15	14:30	AN ANALYSIS ON EVACUATION TO HIGHER PLACES CONSIDERING CAPACITY OF SHELTERS IN A TRADITIONAL LOWLAND TOWN Mine Yudai, Mishima Nobuo and Fuchikami Takayuki
14:30	14:45	RANKING OF RISKS FOR METRO TUNNEL CONSTRUCTION USING FAHP IN JINAN, CHINA Hai-Min Lyu, Shui-Long Shen and Ye-Shuang Xu
14:45	15:00	BUILDING MAMAGEMENT UNDER LIMATE CHANGE CONDITION FOR MEKONG DELTA IN VIETNAM Le Trung Phong, Nguyen Anh Dung, Nguyen Ngoc Thang and Nguyen Tien Chuong
15:00	15:15	A STUDY ON LAND USE TRANSITION AFTER MODERN TIMES AROUND RIVER OF A LARGE-SCALE ONSEN TOWN IN LOWER AREA OF MOUNTAINOUS COUNTRY Kouhei Hanamoto, Nobuo Mishima and Takayuki Fuchikami
15:15	15:30	
15:30	15:45	*Coffee break*

From	To	Chair person: Prof. Hoang Vinh Hung; Assoc. Doan Thu Ha
15:45	16:00	A STUDY ON EVALUATION CRITERIA OF LAND PANORAMA VIEW FROM TEA PLANTATION FOR GREEN TOURISM S. Kawahara, N. Mishima and T. Fuchikami
16:00	16:15	ENHANCING THE EXPERIENCE OF WORLD HERITAGE SITES VIA CYCLING FOR CHIANG MAI, THAILAND R. Angkasith
16:15	16:30	A STUDY ON INTERMODAL TRANSFERS OF PHETCHABURI STATION BY LINKING BANGKOK'S CANALS NETWORKS TO MASS RAPID TRANSIT LINES P. Iamtrakul and I. Raungratanaamporn
16:30	16:45	ASSESSING THE TRENDS OF URBAN SPRAWL AND ITS ENVIRONMENTAL IMPACT ON BASINS OF MOUNTAINOUS REGIONS, CASE OF KIGALI, RWANDA I.Rwampungu and N. Mishima
16:45	17:00	FINITE ELEMENT ANALYSIS OF THE GLUED LAMINATED TIMBER'S BEHAVIOR AND INFLUENCE OF THE GEOMETRICAL PARAMETERS TO ITS RESISTANCE T. Van Dang and O. Marc

Thursday, 27 September 2018

SESSION U1: CITY PLANNING AND MANAGEMENT

Room 4 - K1 Building

From	To	Chair person: Dr. Le Quynh Chi; Dr. Nguyen Anh Dung
8:00	8:30	"City planning and management" Session U1 *Keynote Lecture - Water surface system in rural area, change and transformation, problems, local movement in the context of urbanization and climate change* Dr. Le Quynh Chi - National University of Civil Engineering, Vietnam
8:30	8:45	STUDY ON IMPROVEMENT OF OFFICE VENTILATION SYSTEM FOR GOOD AIR QUALITY IN THE LOWLAND AREA OF THAILAND Sasipa San-glar and Shoichi Kojima
8:45	9:00	EVALUATION OF INDOOR THERMAL COMFORT IN BURMESE TRADITIONAL HOUSE DEPENDING ON THE TYPES AND LOCAL MATERIALS Thet Su Hlaing and Shoichi Kojima
9:00	9:15	PROSPECTS AND DESIGN PERSPECTIVES OF AN AEROTROPOLIS IN BANGLADESH: A CASE STUDY ON ISHWARDI A. N. Kakon, M. R. A. Asif, F. Reza and N. Mishima
9:15	9:30	THE URBAN COASTAL AREA FOR TOURISM DEVELOPMENT IN VIETNAM - NEED OF INTEGRATED PLANNING AND SUSTAINABILITY N. Trung Dung
9:30	9:45	STUDY ON CLASSIFICATION OF LOCATION NORMALIZATION PLAN Kenshiro Nonaka, Takuro Inohae and Somsiri Siewwuttanagul
9:45	10:00	*Coffee break*

From	To	Chair person: Dr. Le Quynh Chi; Dr. Nguyen Anh Dung
10:00	10:15	SENSOR NETWORK BASED CYBER PHYSICAL INFRASTRUCTURE FOR WATER SUPPLY NETWORK K R Sheetal Kumar, M S Mohan Kumar, Anjana G R, Ashish Joglekar, Amrutur Bharadwaj, Ashwin Srinivas and Ninad D. Sathaye
10:15	10:30	EVALUATION OF GRID PATTERN CITY IN TROPICAL ZONE CONSIDERING URBAN MORPHOLOGY VIEWING FROM SHADING ASPECT Khaing Myint Mo and Nobuo Mishima
10:30	10:45	DYNAMIC SIMULATION OF ADAPTATION POLICY FOR FLOOD IMPACTS ON URBAN ACTIVITIES: A CASE STUDY OF KHON KAEN, THAILAND H. Kikuchi, A. Fukuda, N. Tsumita and T. Takigawa
10:45	11:00	A BASIC ANALYSIS ON URBAN LANDSCAPE CONTINUITY IN A LOWLAND URBAN HERITAGE USING DEEP LEARNING BASED METHOD M. R. Derbel, J. Makhlouf and N. Mishima

KEYNOTES

WATERSIDE CITY

Sadao Watanabe[1]

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Abstract:

Cities, especially castle towns that are the great part of origins of capital cities in the world, were developed on the waterside, such as port or river. The waterside provided places of interchanges of goods and people, so its economic activities promoted growth of cities. Considering such activities, Makuhari Bay Town in Chiba Prefecture, Japan, was planned and developed as a result of economic activities and developments of Tokyo area, as well as a challenge of development of the area as a complex town with 26,000 persons and 8,100 units on the reclaimed land along Tokyo bay sea coast. The one of focus points of development was creation of landmark.. Vitalization of habitants activities were expected in the connection with commercial and business activities. As results, community participation has been established after their self-management of facilities and various voluntary activities. Furthermore, the view to Mount Fuji over the sea should be kept as an axis of the bay town, although the facilities should be maintained and changed in the future.

Keywords: waterside, new sub-center, residential area, self-management, urban design policy

AN IMPORTANCE OF GROUNDWATER FLOW SYSTEM IN THE SUSTAINABLE WATER RESOURCES MANAGEMENT AND USE

Maki Tsujimura

University of Tsukuba

Abstract:

The groundwater dominates the fresh water resources on the earth, especially the role of the groundwater becomes more important in the arid/ semi-arid regions with vulnerability, and the groundwater flows in the hydrological cycle, interacting with surface water. The major factors deciding the groundwater flow system are source, flow path and age. The multi-tracer approach is effective to elucidate those three factors using the environmental isotopes, the gas, the solute constituents and the microbes. In addition, the tracers are able to evaluate the interaction between the surface water and the groundwater, and the inter-aquifer flow, as well. In the key note lecture, we would like to describes a principle of the multi-tracer approach in the groundwater flow processes investigation, and show some cases of the applications of this approach, applied in Tunisia, Mongolia, Vietnam, Japan and New Zealand.

SLOPE STABILITY STUDIES ON LATERITIC FORMATIONS

Biji Chinnamma Thomas [1], R. Shivashankar [2], Meera Susan Varghese [3] and Yashvantha N Prabhu[4]

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Abstract:

Slope stability problems are a common feature in the study area considered in this paper, which is the western coast of peninsular India, particularly coastal regions of Dakshina Kannada and Udupi districts of Karnataka. This is a very heavy rainfall area, having over a dozen west flowing rivers and hundreds of tributaries and rivulets. There are many low-lying areas which get inundated during heavy rains and throw the normal life out of gear. The soil stratification in this area primarily consists of lateritic soils. Lithomargic clays which are products of laterization, are seen sandwiched between the hard and porous weathered laterite crust at the top and the hard granite or granitic gneiss underneath. Lithomargic clays behave as dispersive soils and are highly erosive by nature. Excavated slopes for railway and highway projects in such lateritic formations, especially in the low-lying areas, pose serious erosion and slope stability problems due to seeping water through the body of the slopes. In one part of this study, laboratory hole erosion tests are carried out to study the erosion characteristics of controlled samples of lithomargic clays with varying percentage of fines, with heads varying from 50 cm to 155 cm. All the samples underwent progressive erosion beyond a head of 110 cm. In another part of this study looks into finite element numerical analysis done to study the slope stability of excavated slopes in lateritic formations. In addition to the usual factors such as shear strength parameters of the soils and geometry of the slope considered in slope stability analyses, additional factors such as vegetation on and near slope, precipitation, ponding at top, seepage through the slope and erosion are also considered. It is concluded that these additional factors also contribute significantly to the factor of safety values.

Keywords: slope stability, erosion, hole erosion test, vegetation, lateritic formations, ponding

APPLICATION OF SDS AND SD-SAMPLER TO SURVEY ON EMBANKMENT IMPROVED BY FLOATING COLUMNS

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Abstract:

In geotechnical engineering, ground information is quite important especially for piling works, ground improvement or prevention of disaster. A lack of the information would lead to unsuspected settlement of a structure or increasing disaster damage. Information from boring logs is provided in many cases of construction. It is quite reliable but always ungratified in volume, nothing expected to be added, because of the limitation of construction cost. Alternatively, interpolation of their information may be performed in some ways such as using sounding tests.

In this presentation, a new sounding method, named Screw Drive Sounding, is introduced. The approach to soil classification is different from other sounding tests such as CPT and SPT. The methods of testing and interpreting the results are explained. As an application of the test, the survey on unsuspected settlement of the embankment treated by floating columns is reported.

Keywords: Soil investigation, Sounding, Soil sampling, Soil improvement

THE FAILURE OF ROAD EMBANKMENT ALONG THE IRRIGATION CANAL IN THE SOFT CLAY SUBSOIL FROM PROLONG DROUGHT AND MITIGATION SCHEMES

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Abstract:

The failure of road embankment along the irrigation canal has been going on for decades in the lower flood plain of Bangkok and nearby cities. Those cities located over the soft marine clay deposit in the Holocene period. The major reason that contributed to the failure was the rapid drawdown of the water level in the canal during the seasoning change period from rainy season to dry season. After 2011 Great flood of Bangkok, the road embankment along the irrigation canal was heightening and strengthening to not only be a road but to be a flood protective wall. However, recent unusual prolong drought from 2015-2016 caused a significant increase of number of failure. The failure occurred when the canal stayed completely dry for some time. The detail investigation has been done to gather the statistical information about the failure. Soil boings and geophysical survey has been employed. FEM and LEM analysis has been reanalyzed in order to improve the previous soil investigation and design practice. Centrifuge modeling also performed to observe the effect of ground water table change and some climatic impact to the potential cracks that may lead to progressive failure of slope. It is found that the failure locations are mostly found where the irrigation canal intersect with the old natural canal and where there is a source of water that can seep underneath the road embankment to the dry canal. It also found that that when the canal dried, the underground water will seep and exit at the toe slope of the canal causing the lowering of the shear strength in the lower portion of slope hence caused the failure. As for the road embankment with I-wall, lower slope might fail first causing the reduction of the passive resistance and then the whole

system collapsed. Furthermore, the conventional site investigation for designing the road embankment may not be suitable for designing the road along the canal. Geophysical survey can aid the investigation to find the soft spot. These findings are very useful for adjusting the site investigation method and design code for road embankment along the canal in the soft clay area. The effectiveness of using short piles to prevent the failure were investigated by mean of centrifuge and computer simulation.

Keywords: Road embankment, soft soil, Road along the canal

THE APPLICATION OF FLASH FLOOD GUIDANCE SYSTEM FOR EARLY RISK WARNING IN MOUNTAINOUS REGIONS OF NORTHERN VIETNAM

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Abstract:

Flash flood is one of the world's deadliest natural disasters, usually as a result of intensive rainfall in mountainous river basins with steep slopes and poor soil structure. Flash flood and landslide warnings are still a big challenge even in developed countries. In recent years, the National Centre for Hydro-Meteorological Forecasting has applied the Flash Flood Guidance System (FFGs) for flash flood warning in Vietnam. This system has been developed by the Hydrologic Research Center (HRC) through the development project between the World Meteorological Organization (WMO) and the Mekong River Commission (MRC). The FFGs calculates the possibility of flash floods on small areas-based observation of rainfall, satellite rainfall estimates, soil moisture and other basin characteristics. The products of the FFGs have been used in flash flood warning in the Northern Mountainous Region and provided positive outcomes for disaster prevention and mitigation.

Keywords: Flash flood, heavy rain, natural disaster, FFGs, warning.

WATER SURFACE SYSTEM IN RURAL AREA, CHANGE AND TRANSFORMATION, PROBLEMS, LOCAL MOVEMENT IN THE CONTEXT OF URBANIZATION AND CLIMATE CHANGE

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Abstract:

Since 2008, the state of Vietnam has launched a national program on New Rural, in which the 1st period in 2010-2015 targeted to improve the infrastructure in separate communes, the 2nd period in 2016-2020 recognizes the importance of linkage of communes in district scale. However, the New Rural program has not included the differences in economic development and cultural characteristic, especially in suburban districts adjacent to major cities. Moreover, despite that the climate change has been urged by Ministry of Resource and Environment, its content has not been included in the planning process. In this context, water surface in peri-urban villages has been under the great influence of urbanization and climate change, especially after 2000 when Vietnam increases integration into the global economy and culture. Through subsequence study in recent years in suburban district in Hanoi , it points out the change in economic and society, transformation of water bodies, negative influence due to climate change and urbanization, and local movement toward the water surface beautification. The conclusion is that it is in need to identify the water surface as an important component of green infrastructure in rural planning, the planning approach should base on both two aspects (1) technical aspect as the place to mitigate the inundation (2) social aspect as the place to tighten the community relationship, in order to increase the resilience of rural communities.

GEOTECHNICAL AND GEOENVIRONMENTAL ENGINEERING

SOIL RESISTIVITY STUDIES RELATED TO CORROSIVE NATURE OF LATERITIC SOILS FOR BURIED PIPES

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Abstract:

Electrical Resistivity (ER) method is found to be a quick and effective method for analyzing the corrosive nature of soil samples. ER and most geotechnical parameters are correlated. This paper presents a corrosion study of locally available soils through laboratory electrical resistivity and their geotechnical parameters. These soils having different percentages of fines, whose degree of saturation were varied, were (a) contaminated by phosphoric acid of various normalities and (b) blended with different percentages of bentonite, to study their geo-electrical and geotechnical properties, and to analyze their corrosion potential.

Keywords: Corrosion, buried pipes, lateritic soils, geo-electrical properties, soil moisture, soil pH,

EFFECT OF RBI GRADE 81 STABILIZER ON PAVEMENTS IN LOWLAND AREAS AND HEAVY RAINFALL AREAS

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Abstract:

Construction of pavements in the lowland areas of coastal region has been always a problem due to the heavy rainfall, which makes the pavement to be submerged most of the times. This makes the pavement non-durable. The presence of expansive soils with high clay content will also leads to volume changes during heavy rainfall. Black Cotton Soil (BC Soil) is one of the expansive type of soil that experience significant volume change associated with changes in water content. In this study, efforts have been put to determine the durability properties of BC soil. The collected BC soil sample was treated with the commercial proprietary cementitious stabilizer i.e., Road Building International Grade 81 (RBI 81) with 2%, 4%, 6% and 8% of mix proportions. The engineering properties of the soil treated with RBI 81 and the untreated soil were studied. The Unconfined Compressive Strength (UCS), California Bearing Ratio (CBR), Free Swell Index (FSI), Durability and Fatigue Life test results determined for different curing periods under soaked and unsoaked conditions have been discussed. Chemical composition of untreated and treated soils was studied to understand the mechanism of stabilization with respect to BC soil. Soaked CBR test results indicate that the RBI 81 works well with BC soil. The 7 days cured specimens have been subjected to 12 cycles of Wet Dry and Freeze Thaw in a fully submerged system. It is found that the durability of soil increases substantially by the addition of the higher percentage of RBI 81. Fatigue test results indicate a high fatigue life for all treated samples when subjected to repeated loading by considering 1/3rd of UCS strength values. In order to compute stress-strain responses to the applied traffic loads, the

pavement design software KENPAVE was used. From the results of the experimental works and KENPAVE analysis, it has been observed that BC soil can be effectively stabilized with RBI Grade 81 in lowland areas.

Keywords: Black Cotton Soil, RBI Grade 81 stabilizer, Unconfined Compressive Strength (UCS), durability properties, KENPAVE analysis.

STRENGTH AND MICROSTRCUTURE ASSESSMENT OF RECYCLED ASPHALT PAVEMENT - SLAG GEOPOLYMER AS A ROAD MATERIAL

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Abstract:

This paper presents the results of the investigation on strength and microstructural development of slag (S) based geopolymer stabilized recycled asphalt pavement (RAP) as a pavement base material. The influence of a liquid alkaline activator (L = NaOH/Na_2SiO_3 ratio) on strength development was characterized by unconfined compressive strength (UCS) test and its microstructural development was examined by scanning electron microscopy (SEM) and X-Ray Diffraction (XRD) analyses. The XRD and SEM analysis results shown that the main geopolymerization reaction product of RAP-S geopolymers was calcium alumino-silicate hydrate (C-A-S-H). The S based geopolymer exhibited a slow geopolymerization reaction when L = NaOH/Na_2SiO_3 = 100:0 (without Na_2SiO_3). The silica presented in Na_2SiO_3 was highly soluble, hence a suitable content of NaOH/Na_2SiO_3 = 60:40 can produce RAP+20%S geopolymer as a base material whose 7-day UCS value met the minimum strength requirements specified by Department of Highways, Thailand. However, the presence of silica retarded the geopolymerization formation rate due to the excess Na_2SiO_3 content used, leading to the UCS reduction. The outcomes from this research was found to be initiated the innovative technologies and the improvement made in practical applications of S based geopolymer as a sustainable production by using the recycled waste material in road construction.

Keywords: Recycled asphalt pavement, slag based geopolymer, microstructural analysis, pavement structure.

BEARING CAPACITY OF RING FOOTING ON REINFORCED FOUNDATION BED OVER SOFT GROUND

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Abstract:

Soft ground, which is widespread throughout the world along deltaic and coastal regions, has high water content, low undrained shear strength and high compressibility. As a result, structures built on soft ground are likely to face problems of stability and deformation. A composite bed of granular material and geosynthetic reinforcement, called reinforced foundation bed (RFB), enhances the bearing capacity of a shallow foundation in soft ground due to the shear resistance mobilized along the granular fill-geosynthetic interface. Among the various types of shallow foundations, ring footings, which support chimneys, silos, storage tanks and bridge piers, prove to be an interesting problem for geotechnical engineers. This paper presents a simple approach to estimate the ultimate bearing capacity of a ring footing on RFB over soft ground. Meyerhof's analysis of the ultimate bearing capacity of footings on two-layered soils forms the basis of this study. The values provided by Keshavarz and Kumar (2017) for the bearing capacity factor Nc for rough ring footings on a cohesive–frictional soil are incorporated in the formulation. Furthermore, the axial resistance mobilized by a single, circular sheet of geosynthetic reinforcement due to interfacial shear stresses developed over the top and bottom surfaces of the reinforcement and granular fill is taken into account. A parametric study quantifies the effects of various parameters on the degree of bearing capacity improvement. Additionally, bearing capacity ratios (BCR) are proposed to quantify the relative contributions of granular fill and geosynthetic reinforcement towards improvement of bearing capacity of ring footing. Predictions compare well with experimental results of Shalaby (2017) in literature, for relatively smaller thicknesses of granular layer.

Keywords: Bearing capacity, ring footing, reinforced foundation bed, soft ground, geosynthetic reinforcement, bearing capacity ratio.

THE INVESTIGATION ON COLLAPSED RIVERBANK PROTECTION STRUCTURE AND REMEDIAL APPROACH

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Abstract:

This paper presents the case study of the collapsed riverbank protection structure along the Pasal river in Saraburi province, Thailand. The site investigation and finite element analysis using PLAXIS 2D results show that the failure occurred in sliding mode due to the natural forces. During the rainy season, water flow from the farmlands to the river by crossing the backfill of the retaining wall. Hence, seepage force was developed in the direction of the flow and induced stability of the riverbank protection. Furthermore, the rivers and streams continuously scour the banks and undermined the natural slope, which caused the soil erosion in passive zone and resulted in instability. Based on these causes of failure, a new reinforced retaining wall structure using bored pile, geocomposite, and riprap at the front of retaining wall to protect the circular failure mechanism, seepage forces, as well as soil erosion and sedimentation, respectively was designed. The finite element verification on the new retaining wall structure showed that this structure hand a sufficient factor of safety against the external and internal slope failure.

Keywords: Riverbank protection structure, seepage force, erosion, finite element analysis.

MECHANISM OF INTERNAL INSTABILITY OR SUFFUSION OF COHESIONLESS SOILS: SELF-FILTERING CRITERIA AND STRESS TRANSMITTING BETWEEN PRIMARY AND LOOSE PORTIONS

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Abstract:

This study is an investigation into a phenomenon called internal instability or suffusion of cohesionless soils frequently occurring within earth structures under seepage condition. This investigation focuses on a self-filtering criterion using constriction-based techniques for assessing the potential of the phenomenon. The results show that the demarcation value of DC/DF = 1, where DC is the controlling constriction size of coarse portions and DF is the representative particle size of finer fractions, can be used for this assessment. In addition, the study also considers the interaction between the primary (or coarse) fractions and the loose (or finer) ones in terms of mutually transferring imposed stresses. The outcomes demonstrate the strong relation between the percentages of loose fractions and the degrees of stress transmitting.

Keywords: Internal erosion, Suffusion, Internal instability, Soil modeling, Soil constitutive, Filtration.

SPATIAL DISTRIBUTION OF VOLCANIC ASH SOIL LAYERS IN MASHIKI TOWN, KUMAMOTO

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Abstract:

The first earthquake with magnitude 6.5 occurred on April 14, 2016.The second earthquake with magnitude 7.3 struck on April 16, 2016.The earthquakes inflicted severe damage to residential area because of liquefaction, slope failure, and collapse of retaining walls in Mashiki town, Kumamoto, Japan. Ground properties in Mashiki town are classifiable as alluvial ground or volcanic ash. The alluvial ground is located on the southern side of Akitsu River. Hard weathering Aso4 distal pyroclastic flow deposits are called Haido. Akaboku, Kuroboku, and Haido are highly sensitive and have a low N-value. Apparently, volcanic ash soils showed decreased strength by the first earthquake because their sensitivity is high, with damage to residential land because of the second earthquake caused by degradation of strength. A geo-information database is effective for elucidating the ground properties. But electrical geo-information is lacking in the objective region.

Existing paper geo-information of borehole logs in the region was changed to electronic data for this study. Using the geo-information database and the geographical information system (GIS), the spatial distributions of Kuroboku, Akaboku, and Haido layers in the objective region were investigated.

The main conclusions are the following.

1) Digitalizing geo-information of the borehole data with a shallow depth supports investigation of the regional ground properties. Furthermore, adding estimation lines of soil layers on sectional view can elucidate their properties.

2) Most areas around Akitsu River is soft clay ground. The soft clay layer is apt to be regarded as continuous in Mashiki town by borehole logs. The area around

Akitsu River has alluvial soft clay ground. Also, one northern side of the river is volcanic ash clay ground such as Akaboku, Kuroboku, and Haido.

3) The maximum elevations of Akaboku, Kuroboku, and Haido are inclined gently to Akitsu River. The trend is apparently the same situation for each layer.

Keywords: Volcanic ash cohesive soil, Geographical information system (GIS), Geo-information datavase, Spatial distributio.

NUMERICAL ANALYSES OF SETTLEMENT AND STABILITY OF BRIDGE APPROACH BUILT ON EXPENDED POLYSTYRENE (EPS)

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Abstract:

Using Expanded polystyrene (EPS or EPS geofoam) as the solution for the settlement at the bridge approach has been proved successfully in many countries around the world. However, the study of applying the material to handle the problem in Vietnam is limited. The main goal of this paper is to present a replacement method using EPS as embankment fill at bridge approach. Laboratory tests including direct shear and unconfined compression test were conducted to determine properties of the material. Furthermore, numerical modelling using finite element computer programs Plaxis 2D was carried out to evaluate the effectiveness of the bridge approach built on EPS in a hypothetical geometry with soil profile taken from a real project in Mekong Delta in Southern of Vietnam. Results of the numerical modelling on settlement, lateral displacement and stability for the project using the material were compared to those obtained from non-replacement one.

Keywords: Expanded polystyrene (EPS), Bridge approach, Differential settlement, Numerical analyses.

RESPONSE OF TWO PILE GROUP UNDER MOMENT LOADING

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Abstract:

Structures like bridge piers, chimneys, high rise buildings, high retaining walls, offshore structures, wind turbines, electrical transmission line towers are more likely to be subjected to moment loading. Deep foundations in the form of pile groups are most suitable foundation type to resist large moments due to eccentricity. The behavior of foundations under non-axial loads depends on the deformation characteristics of the foundation and the ground, especially in case of soft marine deposits and in reclaimed areas. Non-axial loads induce moments on the foundation. Hence estimation of the response of deep foundations in terms of displacements and rotations under moment loading is necessary for proper design with safety and serviceability.

Two pile group subjected to vertical eccentric load is analysed based on nonlinear relation of load and displacement incorporating pile to pile interaction in load transfer. The ground is modelled as an elastic half space. The effect of normalized eccentricity, relative stiffness factor, length to diameter ratio, and spacing to diameter ratio on load-displacement and moment-rotation responses is analyzed. Results indicated that normalized displacement at centre of the pile group varies nonlinearly with applied load for any eccentricity. For normalised load of 0.6, the normalised displacement at centre of the pile group, increases by about 78% with an increase in normalised eccentricity from 0.2 to 0.75 for the two pile group with Length to diameter ratio of 50, spacing to diameter ratio of 2.5 and relative stiffness factor of 7. Normalized load on the two pile group increases continuously and attains an asymptotic value for any eccentricity. The asymptotic value of normalized load decreases with increase in eccentricity. The displacement of two pile group decreases with increase in pile stiffness or relative stiffness factor for any given value of

load. Two pile group with higher stiffness undergoes lower rotation for any normalized moment. Pile group rotation decreases with increase in spacing to diameter ratio due to lower interactions for any applied moment. The predicted moment - rotation response using the proposed nonlinear theory for eccentrically loaded pile groups compares well with measured response.

Keywords: Non-linear response, eccentric load, displacement, rotation, two pile group.

SEISMIC RESPONSE OF GEOGRID REINFORCED PILED EMBANKMENT SLOPES

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Abstract:

Peninsular India has a long coastline of over 6000 kms, and the coastal areas on the western coast consist of soft marine clays in a narrow strip of around 1 to 10 km width, with depths varying from 10 to 30 m. Increase in urbanization, industrialization and coastal export and import activities demand for the construction of new roads and bridges, very often in lowland situations. It is well established that geogrid reinforced pile supported embankments are a good alternative as a ground improvement technique for the construction of roads and approach roads to the bridges in extremely soft grounds. Many studies are available on the arching phenomenon of these geogrid reinforced piled embankments subjected to static loading conditions. However, very few studies are conducted or are available on these embankments subjected to seismic excitations. Hence in the present study seismic analysis of 3-dimensional finite element models of 4 m high embankment constructed with pulverized fuel ash as backfill material, over 28 m thick soft Cochin marine clay has been conducted using time-history loading. The marine clay support is enhanced with 300 mm diameter end bearing RC piles arranged in a grid pattern, with centre to centre spacing of three times the diameter of the pile. Geogrid with tensile modulus of 2800 kN/m is considered as basal reinforcement beneath the embankment. Behavior of embankments having different slopes such as 1V:2H, 1V:1.5H and 1V:1H which are subjected to time-history accelerations corresponding to Indian Standard (IS-1893) code spectrum for Zone III are analyzed based on the embankment crest settlements, toe horizontal movements and stress concentration ratio. Analysis of results show that the basal

reinforced piled embankment experiences lesser settlements and horizontal movements, even at a steep slope angle of 1V:1H as compared to the basal reinforced embankment without pile supports.

Keywords: Bridge approach embankment, pile foundations, Cochin marine clay, geogrid reinforcement.

ANALYSIS OF HIGH VOLUME ROADS DURING HEAVY MONSOON IN COASTAL AND LOW LAND AREAS

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Abstract:

The pavement deterioration is a serious problem faced in every country, but its reason may vary from case to case. Most of the design practices are based on the assumption that the subgrade lies above the high flood level. But in many parts of the country, where rainfall is very high makes a portion or sometimes the entire structure of the pavement in submerged condition. In such case pavement exhibits deteriorations. The partial or fully submerged condition of pavement adversely affects the pavement materials, especially the subgrade and other layers with soil. The Indian Roads Congress (IRC) 37 provides pavement design sections for different cases, in which Resilient Modulus (MR) of pavement layers is an important factor. In this study, critical cases of reduction in MR values due to the submersion of pavement are considered. Analysis is carried out for different subgrade and traffic conditions suggested by IRC 37 2012 for high volume roads, assuming 25%, 50% and 75% reduction in MR values. For critical cases also same thickness and layers are considered as in conventional pavement sections, and only the MR values are changed. From the results, the increase in strain values and drastic reduction in fatigue and rutting lives are observed for all critical cases. Damage ratio is the ratio of actual load repetitions to the allowed load repetitions and a value greater than one indicates pavement failure. Damage ratio was less than one for conventional design cases, whereas for critical design cases it has increased enormously. The analysis show that, the pavement structures for conventional cases fail when the MR values are decreased and hence design has to be modified in these situations.

Keywords: High volume roads; Resilient modulus; KENPAVE; Damage analysis.

UTILIZING DEEP NEURAL NETWORKS TO PREDICT SHIELD TUNNELING-INDUCED GROUND SETTLEMENTS

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Abstract:

This paper proposes a deep neural network (DNN) model for shield tunneling-induced ground settlement prediction. DNN has powerful ability in describing complicated relationships. To obtain a good performance of the DNN model, differential evolution (DE) algorithm is employed to optimize the structure and super parameters. Then, the performance of the model is tested on a practical case study in karst regions. The results indicate that the prediction accuracy is dependent on the input parameters including geology parameters and parameters of shield machine operation. By considering the potential influencing parameters, the present model can achieve a good agreement between the predicted and measured ground settlements.

Keywords: Ground settlement; Prediction; Shield tunneling; Deep neural network; Differential evolution method.

DESIGN METHOD FOR STEEL ROTATION PILE FOUNDATION IN VIETNAM

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Abstract:

Steel Rotation Pile (SRP) with large diameter steel pipe pile and a helical blade welded to the edge which has a lot of advantages such as rapid construction, small construction area, especially less vibration, less noise, environment friendly and high resistance, has been applied recently in the urban of Vietnam, for Hoang Minh Giam flyover and in the Ring Road No.3 part Mai Dich - Thang Long of Hanoi. However, how to design SRP foundation in ensuring the conformity with the specification for bridge design in Vietnam is an important question so the new Design Specification for SRP has been edited. This article presents the way to find out the method to design SRP for eco-bridge foundation in Vietnam.

Keywords: steel rotation pile, eco-bridge foundation, design method in Vietnam.

SOIL TYPE, RAINFALL INFILTRATION AND THE STABILITY OF UNSATURATED CUT-SLOPES

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Abstract:

This study aims to assess the stability of cut-slopes composed of either low hydraulic conductivity soil (LK) or high hydraulic conductivity soil (HK) under different rainfall conditions. To do that, the cut-slopes of Noi Bai - Lao Cai Highway Project positioned in Yen Bai province were selected for analyzing. A simplified cut-slope profile with a homogeneous residual soil layer was used. A specific amount of rainfall was chosen by analyzing rainfall data in the study area recorded over 10 years. This amount was then distributed uniformly to simulate different types of rainfall including small intensity with long duration (LD) and high intensity with short duration (HI). The study used the coupled hydro-mechanical approach simulating the change of the water pressure head (WPH) within the slope during the rain and its consequence on the slope stability. The results indicate that the hydraulic conductivity of the soil and the rainfall conditions have a significant impact on the stability of unsaturated cut-slopes. For the LK soil slope, LD rainfall has a more significant impact on the stability of cut-slope than that of HI rainfall, while an opposite trend is found in the case of HK soil slope when the HI rainfall indicates a greater impact.

Keywords: Cut-slope, rainfall, slope failure, unsaturated soil, SWCC.

APPLICATION OF SIMPLE DRAINAGE BY SIPHON WATER-LEADING HOSE TO COHESIVE SOIL

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Abstract:

Drainage from cohesive soil takes a long time because of low permeability. In this study, a water-leading hose for dewatering from soils is manufactured by considering capillary and siphon phenomena. In this system, siphon phenomenon of the hose can be applied automatically with negative pressure. The developed hose is applied to cohesive soils which are red soil sampled in Okinawa, Japan. The effects of drainage of groundwater and decrease of water content on ground surface are clarified by laboratory and in-situ experiments in the slope by the water-leading hose. In the laboratory test, the water-leading hose was installed on the surface of cohesive soils. As the results, the water content on the soil surface can be reduced by dewatering with negative pressure. In the field test, the water-leading device was installed into the embankment made by the cohesive soil. From the test results, it was found that amount of drainage is increased after using the water-leading hose.

Keywords: siphon, drainage, dewatering, cohesive soil.

THE NONLINEARITY OF PILLAR DAM AND IMPACT IN COASTAL LOWLANDS OF VIETNAM

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Abstract:

Pillar dams are used in coastal lowlands of Vietnam. Due to the construction features on the weak land, thick sand and mud, the works ensure high waterproofing requirements and the economical construction cost, suitable for the country's situation compared to traditional sluices. The article presents an analysis of nonlinear effects of materials at the pier trunnion of the radial gate. Geological weakness in lowland coastal Vietnam also has a great influence on internal distribution within the Pllar dam. The authors compare the effect of thick sandy conditions and ideal ground conditions, and formulate stress calculus formulas at the main points of the pier, taking into account the influence of the material. Research helps to increase the safety of the design, and to save construction costs in the context of Vietnam's economy.

Keywords: coastal lowland, Pillar dam, stress, the weak soil, Nonlinear

LIQUEFACTION EXPANSION CAUSED BY FORESHOCKS AND MAIN SHOCKS OF JAPAN'S 2016 KUMAMOTO EARTHQUAKE

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Abstract:

Damage caused by liquefaction on the Kumamoto plain occurred from the 2016 Kumamoto earthquake in Japan. Topographically, liquefaction occurred in former stream channels, flood plains, reclaimed land, natural levees, and so on. Especially, areas of liquefaction in a natural levee suggest a band 50-100 m wide, and around 5 km long, extending from the Shirakawa River to the Kase River. Two similar bands of liquefaction have been identified around the Shirakawa River.

The band of liquefaction is apparently a former stream channel, but aerial photographs and the historical record do not support that hypothesis. In general, the natural levee, which is short, has a very high liquefaction potential similar to a former stream channel "MLIT 2013, Witter et al. 2006". However, it is noteworthy that liquefaction has not occurred throughout the natural levee, but in the characteristic bands. Along with topographic characteristics, the liquefaction area expanded from the foreshock to the main shock of the earthquake, as shown by comparison with aerial photographs after each shock.

This study was conducted to investigate factors contributing to liquefaction expansion in the bands of liquefaction caused by the Kumamoto earthquake. After liquefaction expansion situation was investigated using aerial photographs, the liquefaction potential and liquefaction layer in the objective region were calculated from borehole logs. Factors of liquefaction expansion were investigated by comparing the actual and potential liquefaction.

Keywords: Liquefaction area, Liquefaction potential, Liquefaction mesh, Geographic Information System, Boring log, Ground structure.

TECCO SLOPE STABILIZATION SYSTEM AND FINITE ELEMENT ANALYSIS SUBJECTED TO PREVENT ROCK-FALL HAZARDS

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Abstract:

Making people and buildings safe under the risk of rock-fall phenomenon is obligatory. Thank a robust system, called TECCO system that allows preventing effectively the rock-fall. The system is a combination of the high tensile steel thread-bars (soil nail), high tensile steel wire mesh, and the additional components. This technology has been exchanged with GEOBRUGG Company (Switzerland) to VITRAVICO Company and applied in some construction sites in Vietnam. In this paper, firstly, the technology will be introduced in detail related to the construction execution process and the geometrical and mechanical properties of high-performance materials. A finite element model will be presented, allows predicting the mechanical behavior of the TECCO system subjected to the rock-fall impact, and composes the behavior of the materials and the interaction between the components.

Keywords: Soil nail system, high tensile steel thread bar and wire mesh, behavior of material, rock-fall, finite element method, VITRAVICO, GEOBRUGG

SLOPE STABILITY ANALYSIS FOR MULTIPLE SLIDING MASS

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Abstract:

Slope stability analysis has been studied over the past 100 years with various methods and proposals. They mainly focus on single step sliding while multiple-step sliding also often occurs in practice. Multiple-step sliding has different conditions of trigger and development than the single step sliding, so applying current methods is not sufficient to predict multiple-step sliding. In this research, the authors use the integral calculation to study this way of sliding. The results show that applying the common methods of slope stability analysis can give a conclusion that the slope is safe, but in case of incident such as heavy rain eroding the slope foot, then a small sliding mass can be triggered and opened to be multiple-step sliding, so it is important to have an appropriate calculation for this kind of sliding. Hence, the calculation in this study is practical and can help to reduce the sliding risk.

Keywords: multiple-step sliding, slope stability.

ADHESION RESISTANCE BETWEEN SOIL CEMENT COLUMN AND REINFORCED MATERIALS

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Abstract:

Soil cement column is widely used all over the world and can be applied to a variety of construction. In Thailand, it is often used to protect the excavation area in shallow excavation. However, the strength of soil cement column is insufficient to support the lateral pressure. To cope with this problem, the reinforced core pile cement column is one of the popular methods. There are conservative three types of reinforcement with wooden pile, concrete pile and structure steel. This research is aimed to studying the adhesion between the cement column using different cement content of 10, 15, 20 and 25%, respectively, with the reinforcing materials in three types material, wooden pile, concrete pile and structure steel. The experiment showed that the interface shear strength of reinforce material increased with the increasing of cement content of soil cement admixed clay. The maximum interface shear strength was observed from concrete pile reinforcement were 216.06 kPa, followed by soil cement column reinforced with wooden pile of 143.93 kPa. The steel reinforced soil cement column exhibited minimum adhesion strength of 85.15 kPa with cement content of 25%. The adhesion factor between soil cement column and reinforcing material was 0.11, 0.125 and 0.25 for reinforced with structure steel, timber pile and concrete pile, respectively. The parameters obtained from this research are useful for analyzing the accurate behavior of soil cement column.

Keywords: Soil cement column, reinforced core pile, adhesion resistance.

DETERMINING THE EFFECTIVE STRESS FIELD IN SOIL ACCORDING TO THE SHEAR POTENTIAL

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Abstract:

Soil mechanical behavior does not agree with the elastic theory, but complies with Mohr-Coulomb yield criterion and Terzaghi's effective stress principle. The deformation of soil as well as its shear strength depend on the effective stress. Thus, in this paper the author develops a new method to determine the effective stress field in soil based on the shear potential. In addition, to clarify the suitability of the new method, the author uses the shear potential to find out the stress field due to a uniform strip load on a homogeneous half space. The obtained results are compared to the Flamant solution.

Keywords: effective stress field, shear potential, uniform strip load, elastic theory.

USING DENITRIFICATION TO MICROBIALLY REDUCE WATER SATURATION FOR SOIL IMPROVEMENT

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Abstract:

Improving and altering soil foundation conditions is a common task in construction and civil engineering, especially in low land areas with high ground water level. Microbially induced desaturation and precipitation (MIDP) via denitrificaton is a method that can be used to desaturate sandy soils and shows potential to mitigate liquefaction. Experiments have shown that biogas production at ambient pressure conditions induced excess pore pressures, which generated a hydraulic pressure gradient in the soil and eventually resulted in water seepage through these pores towards the surface of the sand. In this study, the process and its influence on pore pressure were examined at elevated pressure conditions on sandy columns in a triaxial test setup. The results showed that excess pore pressure developed and the patterns appeared to be related to the gas stability and durability in the soil. The gas can be distributed as single bubbles or be mobile and rapidly accumulate. It shows that it is possible to adjust the degree of saturation across small ranges by controlling the microbial conversion reactions, but the pore network structure of the soil is an important factor affecting the gas distribution that needs to be further investigated before the method is applied in practice.

Keywords: MIDP, ground improvement, pore pressure,

PHYTO-FENTON PROCESS FOR THE REMEDIATION OF ORGANOCHLORINE PESTICIDES-CONTAMINATED SOILS

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Abstract:

A combination of phyto-remediation and nano Fe_3O_4 is a novel technique for removing organic pollutants in soils due to Fenton reactions degrading contaminants. In this work, pot experiments were conducted for 6 consecutive months to evaluate the impact of growing vetiver and added quantities of nano Fe_3O_4 on biodegradation of targeted organochlorine pesticide residues: lindane, p,p'-dichlorodiphenyltrichloroethane (DDT), p,p'-dichlorodiphenyldichloroethylene (DDE), p,p'-dichlorodiphenyldichloroethane (DDD) in pesticides-contaminated soils in Bac Giang province, Vietnam. Firstly, concentrations of DDT, DDE, and DDD were analysed at different points and depth of a pesticide stockpile in Bac Giang. Vetiver was secondly planted on the contaminated soils that were mixed and divided into 3 zones with different concentrations of added nano Fe_3O_4. Soil samples in each zone were then periodically taken every another month for determining the remained concentrations of the selected organochlorine pesticides (OCPs) by using Gas Chromatography–Electron Capture Detector (GC-ECD). The results showed that total DDT concentrations in the contaminated soils varied from 1.9 to 13 times higher than the approved limit level (10 ppb) set by the national technical regulation on pesticide residues in the soil in Vietnam. p'-DDE + p,p'-DDD to p,p'-DDT ratios were in the range of 13.5-114, suggesting no recent inputs of technical DDTs in the studied area. The concentrations of OCPs decreased as a function of time and vetiver growth. OCP treatment efficiency was strongly and positively correlated with the content of added iron oxides. Lindane concentrations declined from about 2 ppb to undetectable after the first month of test, average DDTs decreased from 79.8 to below 10 ppb after six months, in which the parent compound, DDT was transformed into predominant form, the DDE. The combination system of vetiver and nano Fe_3O_4 can be effectively used for disposal of OCPs-contaminated soils

DEFORMATION AND PERMEABILITY CHARACTERISTIC OF CEMENT-TREATED SOILS

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Abstract:

Soft soil reinforcement methods by using soil cement columns are very popular by enhancing the strength and deformation characteristics of the soft soils. In order to calculate the final settlement of reinforced ground, it is necessary to properly determine the deformation parameters of cement-treated soils. The permeability of cement-treated soils is also necessary to properly calculate the consolidation settlement of reinforced ground. Therefore, this paper mainly studies on the elastic modulus and the coefficient of permeability of cement-treated soils. Several unconfined compession tests and triaxial compession tests have been carried out on the samples of cement-treated soils of Ho Chi Minh City and the Mekong delta. The tests results showed significant difference between the elastic modulus determined by the unconfined compession test and ones determined by the triaxial compession test. The tests results also showed remarkable difference between the coefficient of permeability of cement-treated soils and ones of the untreated soils. Based on the experimental results, this paper proposes the suitable determination of the final settlement and the consolidation settlement of reinforced ground.

Keywords: soil cement columns, elastic modulus, coefficient of permeability, unconfined compession test, triaxial compession test.

DETERMINATION OF THE CBR VALUE OF THE CLAY SOIL BASED ON ENERGY OF THE RIC ELECTRO-MECHANICAL SYSTEM MODEL

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Abstract:

In order to develop simple correlation between the compaction result of the Rapid Impact Compaction (RIC) method and CBR value, a series of compaction tests using the RIC method was performed in the laboratory on clay soils local samples. In this research, the compaction process was conducted and controlled by electro-mechanical new development system of RIC model by varying number of blows, weight and falling height of hammer to satisfy the variation of compaction energy based on the mechanism of Rapid Impact Compaction with frequency 40-60 blows per minute. The soil samples was compacted using a mold with 15 cm in diameter and 25 cm in height which previously has been varied of the water content to obtain optimum moisture water content. The CBR laboratory value on the mold which has been compacted was tested using a CBR test devices, while for CBR field value was determined using Dynamic Cone Penetrometer (DCP) Test on the same mold. As a result, the correlation between the compaction energy of RIC and the optimum moisture content of compacted clay soil has been developed. Furthermore, the correlation of RIC energy compaction to laboratory CBR values has satisfied the logarithmic function. This correlation can be considered for determining the efficiency of the RIC energy method on clay soils compaction.

Keywords: Rapid Impact Compaction, Dynamic Penetration Index, California Bearing Ratio.

NUMERICAL ANALYSIS OF JOINTED ROCK SLOPE: THE APPLICATION OF THE HOEK-BROWN CRITERION VERSUS MOHR-COULOMB CRITERION

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Abstract:

For highly jointed rock slopes which the stability is not kinematically controlled, the rock mass in the slope can be considered as a homogeneous continuum and a suitable failure criterion can be applied to analyze the stability. Conventionally, Mohr-Coulomb criterion is used and the parameters of rock mass must be imperially derived from rock mass classification or equivalently determined from Hoek-Brown criterion. This paper presents an assessment the application of nonlinear Hoek-Brown failure criterion in FLAC/Slope to predict the stability of highly jointed rock slope. Simultaneously, the results of numerical analysis using linear Mohr-Coulomb criterion were presented. The numerical studies show that using Mohr-Coulomb criterion with equivalent parameters may result in factor of safety different from using Hoek-Brown criterion. The reason is that equivalent Mohr-Coulomb's parameters are determined according to stress condition which is usually specified based on the slope height. In fact, the stress condition should be determined based on slope geometry, i.e. height and slope angle. This paper presents some discussions on this issue.

Keywords: Jointed rock, slope stability, Hoek-Brown criterion, FLAC.

APPLICATION OF FUZZY LOGIC FOR DECISION SUPPORT IN SELECTION OF SOFT SOIL IMPROVEMENT SOLUTIONS

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Abstract:

The decisions on ground improvement methods for road embankment on soft soils is an important technical –economic issue. So far the decisions have normally been derived empirically based on the embankment height and the depth of soft soil. In the extreme cases, such as when the embankment height and the depth of soft soil are large, the decision is simple and straightforward. However, for most of the cases, the decision is not easy. Especially, when a large amount of data needs to be handled this empirical decision making approach may result in inconsistent and irrelevant outcomes. In this context, an assistance of a software to quantify and manage a huge amount of data is necessary so as the decisions are transparent and consistent.

This paper introduces a method using Fuzzy Logic as a Decision Support System in selection of soft-soil treatment solutions. The system includes a structured module to analyse and represent data by fuzzy rules and establish a match between input and output in a Fuzzy Logic Controller to propose the solution. A comparison with the Detailed Design of Hanoi –Haiphong Expressway shows that the method is effective in delivering sensible, consistent and systematic output for supporting decision on engineering problems.

Key words: Fuzzy logic, fuzzy rule, decision support, soft soil, treatment method.

THE EFFECT OF CHANGING WATER LEVEL ASSOCIATE THE REASONS EVERY OF YEAR WITH THE STABLE RIVERSIDE RETAINING WALL

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Abstract:

The paper presents the result of analyzing the effect of changing the water level on the riverside retaining wall on the soft soils. The subject requires to test the changes in stresses, displacements of soft soil as well as the stable retaining wall between the rainy and dry seasons. To concretize of effective water level on the reinforced solution, the structural reinforced concrete retaining wall with the precast concrete piles were selected to do research. The numerical modeling has been used to model the behavior of retaining wall riverside through PLASIX 2D commercial software. The results of the research indicate that the factor of safety will reach higher valuable about 13% in the rainy reason compared to the dry reason; and the stresses increase to 10% at the partial end piles. The generalized displacement of construction, however, increases by 1.3 times than that of lower water level in the year.

Keywords: landslide, stability, stress-strain, reinforced wall riverside, water level.

NUMERICAL ANALYSES OF RAINFALL-INDUCED SLOPE FAILURES: BACK ANALYSIS OF A ROADSIDE SLOPE FAILURE CASE ALONG THE CONNECTING ROAD OF SUNGGUMINASA-SINJAI IN INDONESIA

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Abstract:

Every year during the rainy season, rainfall-induced failures of roadside slopes frequently occur in some parts of connecting roads among districts through hilly areas in South Sulawesi, Indonesia. These occurrences particularly endanger people on the roads, people living next to the slopes and distract traffic fluency through the roads. This research aimed at determining main factors triggering the slope failures. One of the sites, a main road connecting between Sungguminasa and Sinjai (both district cities), Km 109 from Makassar (capital city of South Sulawesi Province), was chosen as this research location. Field and laboratory soil testing were conducted to obtain soil parameters required to perform the analyses of the slope failure mechanisms. Rainfall data from the closest rain gauge station to the site were also collected to consider in the analyses. Numerical analyses using commercial software SV Flux coupled with SV Slope were performed to examine the slope failures triggered by rainstorms. The analyses revealed that a particular stratification of surface soils with silt layer (changing its thickness with the slope level, thicker layer into the slope crest) overlying clay layer existing at the roadside slope greatly contribute to the slope failure.

Keywords: Numerical analyses, rainfall, infiltration, slope failure, stratification of soils, connecting road.

EXPERIMENTAL STUDIES ON THE EFFECTS OF SIZE OF SAMPLE ON CONSOLIDATION CHARACTERISTIC OF SOILS

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Abstract:

In order to calculate the settlement of ground, it is necessary to properly determine the consolidation parameters of soils. The soil samples of different sizes may have differences in the consolidation parameters. Therefore, this paper mainly studies on the effects of size of sample on consolidation characteristic of soils. Several oedometer experiments have been carried out on the samples of different diameters and heights of Ho Chi Minh City soil. The tests results showed significant difference between the coefficient of consolidation determined by Casagrande method and ones determined by Taylor method. Soil samples of different diameters indicated the remarkable the effects of consolidation pressure on the coefficient of volume compressibility, the coefficient of consolidation, and the coefficient of secondary compression of soils. The experimental results of soil samples of different heights also showed the remarkable changes of the coefficient of volume compressibility, the coefficient of consolidation, and the coefficient of secondary compression of soils.

Keywords: size of sample, coefficient of volume compressibility, coefficient of consolidation, coefficient of secondary compression.

NUMERICAL STUDY ON RAINFALL-INDUCED SHALLOW SLOPE FAILURE: EFFECT OF PERIODICAL RAINFALL

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Abstract:

Prediction of rainfall-induced shallow slope failures is very significant to reduce damages on properties, infrastructures, and lives of people nearby hazardous areas. Nowadays, the common effective tool to predict shallow slope failures is critical rainfall concept because of their simplicity and faster assessment. However, it has been developed based on historical slope failure data, in which many factors those might trigger shallow slope failures are disregarded. This paper attempted to assess the factors probably triggering shallow slope failures. A sets of parametric study were performed via finite element model to evaluate the effect of periodical condition of rainfall on initiation of shallow slope failures. The time to slope failures (Df) subjected to continuous rainfall intensity (If) was collected. The relationship between If and Df for initiation of shallow slope failures (ID thresholds) was plotted. The results indicate that influence of periodical rainfall plays an important role on failure state of shallow slope. The Df subjected to assigned If decreases with a short between two rainfall events. It also results in the fitting parameter represented interception of ID thresholds, strongly. In addition, the general failure mechanism of shallow soil slope is introduced in this paper.

Keywords: Rainfall infiltration, Stability analysis, Finite element, Periodical rainfall, ID thresholds

DEVELOPING AN ANALYTICAL METHOD FOR DETERMINING THE RADIUS OF FAILURE ZONE OF SINGLE PILE IN GENERAL SOIL

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Abstract:

End-bearing capacity of single pile clearly depends on failure zone around the piled tip, which has been assumed by many authors around the world. This research only focuses on one of those respectable proposals where failure zone is analogous to spherical cavity expansion. The purpose of this paper is to develop an analytical method based on cavity expansion theory to determine the radius of failure zone under the piled tip of single pile in general soil. Besides the analytical method, finite element method (FEM) is used to compute the failure zone. Results from this research indicated that the failure zone was equivalent between two methods. The proposed method could be considered as a reasonable way to determine the radius of failure zone of single pile in general soil. Some discussions are also presented in this paper.

Keywords: analytical method, bearing capacity, cavity expansion, failure zone, pile in general soil.

EVALUATION OF FACTORS AFFECTING BENDING FAILURE AND TENSILE STRENGTH, MODULUS OF SOIL-CEMENT COLUMNS IN ARIAKE CLAY

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Abstract:

Embankments on soil-cement column (SC) improved soft ground were simulated by three dimensional (FEM 3D) and the simulated results have been studied in terms of factors affecting the bending moment in the column such as length of columns (L), diameter of the column (D), area improvement ratio (α), stiffness of the ground (s_u), undrained shear strength of the model ground (s_u). From the observation of the simulated results it is found out that all the above-mentioned factors influence the induced bending moments in the column significantly. Further, the unconfined compression tests and the split tensile tests were conducted to evaluate the relationship between the unconfined compressive strength (q_u) and the tensile strength (σ_t) of the soil-cement (SC) columns constructed in the Ariake clay. The relationship between the σ_t - qu for the soil-cement columns in the Ariake Clay is 1/6 for the cement volume varying from 100 kg/m^3 to 200 kg/m^3. The judgement of the bending failure of the SC columns can be done based on the predicted tensile stress (σ_t FEM) and the design tensile strength (σ_t estimated) of the SC columns. The relation between the secant modulus (E50) and the q_u found from this study is E50 = 140 q_u for the SC columns.

Keywords: Embankment, soil-cement columns, bending moment, tensile strength, secant modulus, FEM 3D.

DISASTER IN THE ASHIKARI SOUTH INTERCHANGE ON ARIAKE SEA COASTAL ROAD (SAGA-FUKUDOMI ROAD)

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Abstract:

The Ariake Sea Coastal Road (Saga-Fukudomi Road) was opened on March 26, 2016 from the Ashikari Interchange to the Ashikari South Interchange, and its service section was about 6.5km together with the past opening section. After less than one month due to Kumamoto earthquake (Seismic intensity = 7.0 (April 14 and 16)) in 2016, the recorded seismic intensity in the Ashikari district was 4.0 and 5.0 or less on April 14 and April 16. Then, opening of joints that occurred in plastered concrete/road surface etc in the Ashikari South Interchange, were repaired. However, due to torrential rain of rainy season (called TSUYU) that recorded accumulated rainfall of 264 mm from the early June 22, the embankment collapsed around 0:00 am on June 23, 2016.

For the Saga prefectural government, the Ariake Sea Coastal Road (Saga-Fukudomi Road) is the first experience to construct a high embankment above lowlands. Moreover, the design and construction should overcome the problem of trade-off between environmental preservation and cost reduction. A demonstration embankment was carried out under the technical committee for the soft ground control and the working group, and based on the results, the construction conditions at the site were explored, and finally about 6 km of construction was done successfully. Nevertheless, the Ashikari South Interchange received a double punch of the Kumamoto earthquake and the torrential rain of the rainy season (TSUYU).

Although suffered various hardships afterwards, the restoration work has been proceeding smoothly without exhaustion, and on March 30, 2018 the on-ramp side was recommenced.

The knowledge gained newly in the process of examining the disaster in the Ashikari South Interchange will be discussed in this paper.

Keywords: Soft ground, Embankment, Deep mixing method, Disaster, Physico-chemical properties

ASSESSMENT OF EFFECTIVENESS OF GROUND IMPROVEMENT METHODS - HANOI - HAIPHONG EXPRESSWAY PROJECT

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Abstract:

Hanoi - HaiPhong expressway, one of the most important highway projects in Vietnam with the total length of 105.50 km, has been opening to traffic since December 2015 after 7 years of construction. The Project transverses a geo-technical-complicated region with approximately 85% of the length on deep soft soils. A number of ground improvement solutions have been deployed, among which vertical drains such as prefabricated-vertical drain (PVD), sand drain (SD), and sand compaction pile (SCP) are most popular.

This paper presents an assessment of effectiveness of vertical drain solutions based on actual observed settlements and settlements estimated in the detailed design on 6/10 packages of the Project. The results show that (i) the Detailed Design generally provided a fairly good estimation of settlements with respect to the tendency of settlement profiles; (ii) the design generally overestimated settlements; (iii) the ratios between observed and estimated settlements tend to positively correlate to the thickness of soft soil and the depth of treatment, and (iv) there are positive correlations between the height of embankment and the observed settlement, with the coefficient of determinations of 0.6740, 0.6768, and 0.7042 for PVD, SD, and SCP treatment methods respectively. These relationships may be used as a reference for anticipation of settlements in basic design of highway projects with soft soil treated by vertical drains, in the regions that have geological stratum similar to ThaiBinh and HaiHung formations of BacBo Plain.

Keywords: Ground improvement, settlement, vertical drain.

GEOGRAPHICAL ANALYTIC HIERARCHY PROCESS (GAHP) METHOD TO ESTABLISH LANDSLIDE SUSCEPTIBILITY IN LAIGIANG BASIN , BINHDINH PROVINCE, VIETNAM

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Abstract:

Lai Giang is a basin with a complex geological and morphological structure that, due to its characteristics is frequently affected by landslides after the occurrence of strong rainfall. Recently, in November 2017, a landslide happened 37 households with 110 people demographics in village H're 3, An Nghia commune remained completely isolated because of landslides with more than 3,000 m3 volume. With such a situation Lai Giang basin indeed needs applied systematics studies for mitigating natural hazards and support planning mitigation actions.

A landslide is a natural process strongly related to slope, affected by gravity and other factors related to the formation of soil and its stability. The study of the landscape susceptibility to landslides may be addressed through a geographic modeling approach, based on the integration of different factors (i.e. spatial variables). This article presents a comparative approach of modeling performance of different exploratory spatial analysis methods, aiming to establish a basis for an evolutive knowledge on landslide risk assessment in Lai Giang basin, Binh Dinh province.

Keywords: Landslide, GIS, GAHP, exploratory spatial analysis, Lai Giang.

CHARACTERISTICS OF ARTIFICIAL GRAVEL USING CEMENT STABILIZATION OF SOFT SOIL AS SUB-BASE LAYER

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Abstract:

Several locations have difficulty in preparing natural crude aggregate, so artificial aggregate becomes an alternative choice. This study tries to provide an alternative choice of artificial gravel made of soft soil mixed with cement. Based on the compression test with mix variations of cement 5%, 10%, 15%, and 20%, it was found that the cement optimum content was 12.5%. Materials for the artificial gravel are in the shapes of cubical, triangle prism, and hexagonal prism were made of the same volume. The result of compression test indicates the optimum pressure value on the composition of cement water 3.5. The molded gravel materials were cured for 7 days, 14 days and 28 days. The cured artificial gravel for 28 days, the CBR was retested in each variation by referring to ASTM D-1557/AASHTO T-180. The test result shows that the value of CBR with 56 blows for the cube 25.72%, triangle prism 24.19% and hexagonal prism 28.88%. From the unsoaked CBR test, it was found that the artificial materials with more angles (hexagonal prism) has greater CBR value than the artificial materials of cubical shape and triangle prism. In compliance with the standard, the appropriate gravel materials to be used as a sub-base layer is material with the value of CBR > 20%.

Keywords: soft soil, cement, artificial gravel, water cement ratio, California Bearing Ratio

INVESTIGATION ON FLOOD WALL PROTECTION: A CASE STUDY IN PATUMTHANI PROVINCE, THAILAND

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Abstract:

Nava Nakorn Industrial is a home of world-class companies that serves many types of industries located in Pathumthani Province, Thailand with an area of more than 10 km2. In 2011, the natural disaster, flooding up to about 4.7 m for 2 months caused the impacts in this industrial zone. Therefore, the permanent flood wall protection was built around the industrial area to ascertain the safety and to build the confidence for the investors. This study evaluated the safety and stability of the flood wall against the flooding problem. The flood wall protection evaluation has been divided into three main assessments, including site investigation and soil exploration, examination of the existed flood wall structures, and finite element analysis of its stability. The site investigation and soil exploration, included boring, Atterberg limits, consolidation and triaxial tests to explore the basic and engineering parameters. To evaluate the existed the flood wall protection, the mechanical tests, including Schmidt Hammer test, Ferro scan test, Hardness test, as well as coring and compressive strength test of concrete have been undertaken. Finally, finite element method using Plaxis 2D was carried out to evaluate the internal and external stabilities of the flood wall systems and to predict the water seepage beneath the flood wall protection into the industrial zone. The paper provides the useful information for geoenvironmental engineers and designers as the conceptual ideas to investigate the wall structure and soil parameters and to apply the finite element method for solving geotechnical problem.

Keywords: Natural disaster, flood wall protection, finite element analysis, Plaxis 2D.

CALCULATE THE TREATMENT OF THE ROAD AFTER BRIDGE ABUTMENT USING BAMBOO PILE REINFORCED GEOTEXTILE

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Abstract:

The paper presents the calculation progress and applied the solution of bamboo piles reinforced geotextile for the bridge approaches under the soft soil region from 20 to 30m thickness, the small Diep Thach Bridge, Tra Vinh province. The zone of reinforced bridge approaches has 20m long distance away from the abutment wall, the highest embankment is 2.5m. Bamboo piles are designed for processing with a density of 16 piles/m2, the length of reinforcement is 3m and 2 layers of Geotextile to reinforce for the material. The processing calculation goes from the theory first such applying British Standard BS8006, to determining the basic design for pile systems and Geotextiles. After that, the numerical modeling using PLAXIS 2D software analyze both the settlement and stability of the bridge approaches for the horizontal section as well as the cross-section. The results of computing present the settlement and stability are under the limit as followed the current criteria for embankment.

Keywords: Solution bamboo piles, address, bridge, application, format, stability

APPLYING GEOMATICS RESEARCH COASTAL EVOLUTION OF KONE - HA THANH RIVER'S ESTUARY, BINH DINH PROVINCE

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Abstract:

Shoreline at estuary area is a very complex object and often changes under impacts of natural processes and human. Kone and Ha Thanh rivers are two of the four biggest rivers of Binh Dinh province, the estuaries of them pour out the Thi Nai Lagoon. Shoreline changes at estuarine area have significant impacts on production activities, social life and the environment here. Recently, one of the effective methods for researching shoreline and estuaries is using geomatics techonogy. Remote sensing data including Landsat TM, ETM+, Landsat 8 are used for establishing coastline maps at the estuarine area over timeand shoreline changes maps through periods. Based on shoreline changes maps combined with fieldwork by GNSS and meteorological-oceanographic data, we can evaluate changes' causes and propose orientations for sustainable using Kone - Ha Thanh river's estuary.

Keywords: Shoreline change, remote sensing, GIS, GNSS.

USING ELECTRICAL RESISTIVITY METHOD TO INVESTIGATE SEEPAGE AND INTERNAL EROSION IN EMBANKMENT DAMS

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Abstract:

Concentrated seepage and internal erosion are one of main causes of dam failure in Vietnam as well as in the world. The cost to fix seepage problem is expensive. In this paper, the electrical resistivity method is applied to investigate seepage in Khe Dang dam. Several investigation configurations are applied to study the distance and location (on the surface of dam or in the borehole) of the electrodes. The results are discussed with the observation data from the dam owner to suggest the selection of investigation configuration for the other dams.

Keywords: Resistivity, concentrated seepage, internal erosion, embankment dam

BEHAVIOUR OF TALL TIERED MSE WALLS REINFORCED WITH GEOGRID BY USING PLAXIS 2D SOFTWARE

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Abstract:

Mechanically stabilized earth (MSE) walls consist of a facing element behind which, compacted soil and alternate layers of reinforcement are placed. They are moderately flexible and can tolerate substantial horizontal and vertical deformations. Case studies of MSE walls ranging from 12 to 30m are available in literature. Thus, MSE enables construction of steeper and higher embankments, which will save right of way, savings in materials and above all top of embankment on which the road runs can be above the flood level and traffic can flow uninterruptedly in flood prone (lowlying/lowland) areas. In this research work, Finite-Element Program Plaxis 2D is used to study the behaviour of 5, 10, 15 and 20m high MSE walls by varying the parameters like berm width; backfill and foundation soil strength; strength and stiffness of geogrid reinforcement; surcharge on reinforced backfill. Most specifications require a minimum length of reinforcement equal to 70% of wall height. In this study the reinforcement length is taken as same as the wall height. Spacing between each reinforcement layer is kept constant (0.75m). Geogrid strength are varied as EA = 100, 1000 and 5000MN/m, i.e. from very flexible to very rigid. Very high geogrid strengths do not have much effect on the maximum surcharge load carrying capacity of MSE walls. Rather the maximum surcharge capacity is found to mainly depend on the strength of foundation soil as well as the backfill soil. In other words, the soil yield strengths are reached (soil failures would have occurred) much before the stronger geogrids are stressed substantially. Therefore weaker geogrid is found to perform better because they get stretched/strained to maximum and stressed to the optimum. The

coefficient of lateral earth pressure 'K' were determined at different locations along the length of the reinforcement. K was found to be equal to Ka near facing, equal to Ko near centre and less than Ka just near end of reinforcement and beyond.

Keywords: Mechanically stabilized earth (MSE), Plaxis 2D, Geogrid, Foundation soil, Retained backfill soil, Reinforced backfill soil.

EFFECTIVENESS OF GEOSYNTHETIC ENCASED COLUMNS UNDER FLEXIBLE FOUNDATIONS

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Abstract:

The problems associated with soft soils can be solved either by introducing suitable ground improvement method or by installing deep foundations such as piles. The former method is widely used in coastal areas where the constructions of deep foundations are not feasible. The common method of ground modification in soft soil is the installation of stone columns. This paper aims to find the effectiveness of geosynthetic encasements around stone columns in the long term settlement considerations. The studies were conducted in PLAXIS 3D by simulating a three dimensional homogeneous soil strata with geosynthetic encased stone columns (GESCs). It was observed that the pattern of failure of GESCs are very well influenced by the stiffness of the underlying strata and increased load carrying capacity is shown when stone columns are resting on stiffer strata compared to weaker strata. When the stone columns are resting on soft clay, it is very sensitive to loading and seems to punch into underlying strata and exhibit lesser bulging.

Keywords: Geosynthetic encased stone columns, Plaxis 3D, stiffness of underlying strata, soft soils

EFFECT OF CATIONS ON CONSOLIDATION AND PERMEABILITY OF POLYMERIZED BENTONITE

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Abstract:

Properties of novel material "polymerized bentonite (PB)" and a traditional untreated bentonite (UB) were investigated through two series of laboratory tests (i.e., consolidation and fluid-loss tests). Three different liquids are included of deionized water, 0.6 M NaCl and 0.6 M $CaCl_2$ were used in this study. The consolidation test results indicated that the compression index (C_c) and swelling index (C_s) decreased, while the coefficient of consolidation (c_v) increased with the increasing in concentration and valence of cation in the solutions. Comparison between two materials in 0.6 M NaCl and 0.6 M $CaCl_2$ solutions, the PB had higher C_c and C_s value, but it gave lower cv value compared with that of the UB. The results of estimated permeability (k_{fluid}) from the test results of fluid-loss test showed that the PB had lower kfluid value in the test solutions compared with those of the corresponding UB. Although, the kfluid value showed the same tendency as the calculated permeability (k_{conso}) from the previous study, whereas the kfluid gave overestimated k-value compared with that of the kconso under the identical void ratio (e) condition. Based on test results in this study, the PB can be recommended as an effective lining material against aggressive cationic solutions.

Keywords: Polymerized bentonite (PB), compression index (C_c), swelling index (C_s), coefficient of consolidation (c_v), fluid-loss test, permeability (k).

INVESTIGATION OF RAINFALL AND WATER LEVEL EFFECT ON STABILITY OF DYKE

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Abstract:

River dykes play an important role in socio-economic development. Vietnam disaster management authority reports that there are dozens of instability incidents every year. In this paper, the factor affected the stability of dyke's slope is discussed to identify main cause (variation of pore water pressure). As a case study, the left Chu dyke, Tho Xuan district, Thanh Hoa province are investigated. The finite element method is used to calculate transient seepage due to the variation of river water level (RWL) and rainfall. Limit equilibrium method is used to calculate stability of dyke. Rainfall and RWL of 2012 and 2013 flood season are used for analysis both transient seepage and slope stability analyses. The results shown the variation factor of safety with time, rainfall and RWL.

Keywords: Rainfall infiltration, pore water pressure, stability analysis, finite element, river dyke

WATER AND ENVIRONMENTAL ENGINEERING

SOLUTIONS FOR SPEEDING UP THE CONSTRUCTION PROGRESS OF HIGH PILE-WORK QUAYS

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Abstract:

The quick completion of construction works and ensuring the structural stability during the operation play an important role for all the related parties during the investment in construction works. However, because of many reasons (both objective and subjective ones), the construction works are normally completed later than the required time. This paper would like to present some research results on the solutions to speed up the construction progress of high pile-work Quays.

Keywords: High pile-work quay , maginal quay, construction progress, construction investment, constructive work operation.

MULTI-OBJECTIVE CALIBRATION OF CONCEPTUAL RAINFALL-RUNOFF MODEL IN THAC MO CATCHMENT, VIETNAM

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Abstract:

Conceptual rainfall-runoff model is the simplest hydrological model to evaluation water resources, forecast and control flooding for many catchments. There are much application of hydrological models to Vietnam catchment; however, the important step is doing well calibration model and validation procedure with weather condition and soil characteristics in Vietnam. This study aims to find set of parameters which is can be used for HBV model simulation by using Non-dominated Sorting Genetic Algorithm II (NSGA-II). On the other hand, the data is based on weather and rainfall to divide into wet season and dry season to estimation of objective functions such as Root Mean Square Error (RMSE), Mean Percentage Error (MPE), Nash-Sutcliffe efficiency coefficient (NS). The preliminary results show that algorithm can find compromise solution on Pareto front and set of nine essential parameters for HBV model simulation in Thac Mo catchment and good fit with observation runoff data.

Keywords: HBV model, NSGA-II, Thac Mo catchment, multi-objective optimization

STUDY THE TANNERY WASTEWATER TREATMENT BY USING ELECTROCHEMICAL OXIDATION METHOD

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Abstract:

In the last two decades, electrochemical oxidation has been extensively studied for the treatment of wastewater. This technology consists of the direct and/or indirect oxidation of organic matter in wastewater at the anode or in the solution of an electrochemical device. Under the effects of electricity, toxic and nonbiodegradable wastes will be oxidized into less toxic intermediates and biodegradable or oxidizable to CO_2 and H_2O. In this study, a laboratory-scale experimental model was performed to evaluate the effect of tannery wastewater treatment on electrochemical oxidation with BDD/Ti anode and cathode Pt/Ti. Before the electrochemical oxidation, the tannery wastewater was pretreated by using biological method with activated sludge. Effect of current density, pH of the solution, stirring rate, reaction time were studied on the treatment efficiency. The results show that BDD/Ti anode treated effectively COD and total nitrogen over 85% after 90 minutes electrolysis at the current density 66.7 mA/cm^2. BDD/Ti anode gave higher efficiency with neutral pH and base. The current density and agitation rate affect the treatment efficiency, while the treatment time is inversely proportional to the depletion of pollutants in the effluent. The combination between biologcial pretreatment and electrochemical oxidation help effluents meet the Vietnamese discharge standard after 30-60 minutes of electrolysis.

Keywords: Tannery wastewater, activated sludge, electrochemical oxidation, BDD/Ti.

STUDY AN EFFICIENT TOOL TO COMPUTE HYDRAULIC CHARACTERISTICS OF FLOOD FLOW DOWNSTREAM FROM SMALL RESERVOIRS WITH CONCRETE DAM COLLAPESE SCENARIOS IN VIETNAM

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Abstract:

The paper is dedicated to study an efficient schedule to simulate quickly hydraulic characteristic of dam break flow corresponding with different concrete dam collapse scenarios. Firstly, using a simplified method introduced in Pilotti et al (2010) to generate breach hydrograph at dam site without any numerical calculation; then, insert it as the inflow boundary condition of a hydrodynamic model to compute the propagation of flood flow on reservoir's downstream. Select Ban Mong reservoir (Son La) as a case study to research this proposed method.

Keywords: concrete dam, hydraulic characteristics, hydrodynamic model, Ban Mong reservoir.

CANAL BLOCKING IN AN ATTEMPT TO RESTORE PEATLAND ECOSYSTEMS IN LIANG ANGGANG PROTECTED FOREST IN BANJARBARU

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Abstract:

Liang Anggang protected forest is located in Banjarbaru, South Kalimantan, Indonesia, with an area of approximately 900 hectares, but most have been cultivated by community and the rest is open field that have been burned with vegetation in the form of typical java shurbs and galam (melaleuca leucadendra). The smoke caused by land fires occurring almost every year in Liang Anggang Protected Forest caused the disruption of Syamsudin Noor airport operation and security. In addition, land fires also cause damage to peatland ecosystems, carbon emissions, destruction of agricultural land, health problems, and disruption of community activities. Canal Blocking in Liang Anggang Protected Forest is an effort to conserve water resources so that peatland does not experience drought and flammable by raising and maintaining water level. The method used in the canal blocking in the Liang Anggang Protected Forest is in accordance with the Management Control System of Infrastructure Development and Facilities of Public Works SIDLACOM (Survey, Investigation, Design, Land Acquition, Construction, Operation and Maintenance). Canal blocking is divided into several main parts that are integrated into a system, the dike around the area, the main canal blockinger, and the small canal blocks. With the canal blocking, it is expected to be the initial step in restoring the peat ecosystem in Liang Anggang Protected Forest Banjarbaru.

Keywords: Protected Forest, Peat, Banjarbaru, Indonesia, Conservation, Restoration

A STUDY ON THE CHARACTERISTICS OF CHIKUGO RIVER'S OLD MEANDERING AND ITS TRIBUTARIES WITH THEIR INTERACTIONS AND EFFECTS FOR THE FLOOD CONTROL AND WATER USE

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Abstract:

Chikugo River is a largest river in Kyushu island, Japan. In Chikugo River basin, serious damages by flood and inundation occurred frequently. As a result, many cut-off channels were constructed to increase the capacity of flow rate of Chikugo River from Edo era to Meiji, Taisho Syowa periods. After constructions of these cut-off channels, many old meandering waterways still exist. Tributaries flowing into lower reach of Chikugo River are not flowing into Chikugo River directly but are much seen that they are once flowing into the old meandering waterway of Chikugo River. However, the reason why this system was introduced was not sufficiently clarified yet. On the other hand, because the downstream part of the Chikugo River is lower than the surrounding area so that water flows through the lowest area of the plain and it is difficult to use water. For this reason, fresh water intake in the downstream area of Chikugo River basin had been carried out for a long time by utilizing the large tidal difference of the Ariake Sea. In this study, we conducted a one-dimensional unsteady flow analysis and a two-dimensional inundation analysis in the downstream basin of Chikugo River including the old meandering waterway of Chikugo River and inflowing tributaries to clarify these hydraulic interactions and their functions by considering the presence or absence of the meandering waterway and tributaries. In addition, the effects of the flood control and fresh water intake by this system was investigated in the tidal reach of the tributaries.

Keywords: Chikugo River, meandering, tributaries, cut-off channel, flood control, water use.

ASSESSMENT OF THE FLOOD-CONTROL CAPACITY OF THE UPSTREAM RESERVOIRS OF THE TRA KHUC RIVER WITH THE HISTORICAL FLOOD EVENT IN NOVEMBER 2017

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Abstract:

Every year, floods have caused a lot of damage in the Tra Khuc River basin, especially the flood event in November 2017. Because of the topography, floods in the Tra Khuc River Basin are very fast and complicated. The flood amplitudes are 3-5m, with rising time usually in one day, ranged from 12 hours to 71 hours. The increasing rate in water elevations is usually 30 - 40cm /hour with the maximum up to 78cm/hour. The tidal regime at the Tra Khuc River estuary is semi-diurnal tide with tidal amplitude of about 1.3m and the largest one of 2m. In November 2017, a historical flood in the Tra Khuc River basin occurred causing serious damages to the people's property, although there are two big reservoirs upstream to cut the flood. This paper investigates the effectiveness of flood-control operations of the two reservoirs, Nuoc Trong and Dakrong, located in the upstream of the basin with the historical flood in November 2017. The MIKE11 model was applied to revert the historic flood in November 2017 and then combined with a multi-reservoirs operation model to assess the flood-control capacity of the two reservoirs for the downstream.

Keywords: Flood, flood-control capacity, reservoir, operation.

STUDY ON BIO-FLOCCULATION-ADSORPTION SEDIMENTATION PROCESS IN WASTEWATER TREATMENT

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Abstract:

In this paper, Bio-Flocculation-Adsorption Sedimentation process is applied in the wastewater treatment in the fishery industry. The results of the study show the biological coagulation has the ability to enhance the sedimentation effectiveness to 84.64%. The activated sludge within the bio-flocculation-adsorption tank could be considered a bio-flocculent which contributed to the clean up of effluent through primary treatment. The current preliminary and primary treatments can only reduce total suspended solids (TSS) about 50-60%. This bio-adsorption sedimentation followed by the activated sludge system could achieve the COD removal efficiency of 93.8%. The additional cost of chemicals was therefore eliminated, and secondary pollutant was avoided. It would bring more advantages to facilitate next stages of the biological treatment process.

Keywords: Binh Dong Fishery Company, Activated Sludge, Bio-flocculation-adsorption, Wastewater Treatment.

MODELING FOR ANALYZING EFFECTS OF GROUNDWATER PUMPING IN CAN THO CITY, VIETNAM

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Abstract:

In this study, the steady-state groundwater model in the study area, Can Tho city, a capital of Mekong Delta, was developed. To construct the numerical groundwater model for the Can Tho city, the concept and model boundary were set by hydrological data (model layers), digital elevation map (drainage and surface) and Mekong Delta region groundwater model results (groundwater head boundary). Investigation and compilation of data for the model input such as aquifer properties, hydraulic parameters and meteorological data were conducted and initially assigned to the model for a grid cell. The calibrated model successfully simulated groundwater heads comparing with observation heads at 14 monitoring wells. Simulation of spatial groundwater heads distribution of the aquifer includes groundwater pumping stations for domestic and industry was conducted as expected from the conceptual model. Its results clarified groundwater drawdown areas in the city. Impact zones of groundwater pumping are also addressed and known as vulnerable zones to land subsidence. Finally, to understand the effects of projected increased demands on groundwater for water supply, the model was used to predict the groundwater decline based on the trend of increased pumping until 2035. The formation process of cones of depression under current and increased pumping operation was also modeled in 3D to evaluate the impacts of dense distribution of pumping wells on groundwater resources in the Can Tho city.

Keywords: Modelling, Groundwater head, Simulation, Pumping, Impacts

IMPROVEMENT OF AGRICULTURAL SOIL CHARACTERISTIC IN TIEN LU DISTRICT, HUNG YEN PROVINCE, VIET NAM BY USING SOIL CONDITIONERS

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Abstract:

The present study aims to assess the influence of soil conditioners including bentonite and straw as natural deposits on soil moisture. The evaporation experiments were conducted during February to April 2018 in the laboratory of Thuy Loi University, Viet Nam with soil samples collected from Tien Lu district, Hưng Yen province. The natural soil was mixed with bentonite (of 0, 5, 10% wb) and straw manure at 2% wb and packed in plastic pots to a depth of 50 cm. The soil moisture was determined an interval of 5-7 days. Nutrient characteristics at the end of the experiment were determined for Nitrogen, Phosphorous, and Potassium. The obtained results showed that using application rate of bentonite restricted the water evaporation and kept soil moisture longer while remaining necessary soil nutrients. The limits of moisture lost by evaporation based the role of clay and straw deposit in increasing the soil aggregation that decreased the pore space. Application of rate of bentonite mixed straw 5% to soils in the study areas increase of the soil water holding capacity and nutrition characteristics.

Keywords: Light texture soil, conditioners, bentonite, manure straw, soil moisture, water holding capacity, soil nutrient.

RISK ASSESSMENT OF SEA LEVEL RISING TO RIVER BANK EROSION USING HYDRAULIC APPROACH: A CASE STUDY OF MEKONG RIVER, VIETNAM

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Abstract:

Mekong River, the part belonging to Vietnam, is strongly driven by tidal; therefore, sea level rising (SLR) potentially affects on stability of river bank. The aim of this research is to predict potential impact of SLR on bank erosion of Mekong River, using the risk based approach. Firstly, using real data of bathymetry, water levels, and sediment measured in 2012, the Mike 21 model have been calibrated for a reach of Mekong River from Cao Lanh to My Thuan gauging stations. Then, this calibrated model was used to simulate the data of velocity field at cells in considered domain, corresponding to SLR scenarios forecasted by Vietnamese Government. After that, Near Bank Shear stresses (NBS) were calculated for the cells in near bank zone using velocities simulated from previous step. Finally, using calculated NBS data, the assessment and zoning of risk level of bank erosion have been done basing on criteria developed by David L. Rosgen since 2011. These results could be able to support to local authorities and central government in water related disaster management as well as riverine spatial planning processes under the context of climate change.

Keywords: Mekong river bank erosion, bank erosion risk assessment, climate change impact assessment

APPLICATION OF GIS TECHNOLOGY TO SET UP AN EMERGENCY PLAN FOR CAM XUYEN DISTRICT IN CASE OF TYPHOONS

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Abstract:

Emergency plan is one of the most important measures to mitigate flood damage, especially in a country with a long coast like Vietnam. Almost every district in Vietnam which located along the coast already has emergency plans in case of typhoons. However, the current emergency plans have not yet considered of optimal destinations, as well as distance and direction, therefore they're not fully utilized. This study presents the method to propose an emergency plan for Cam Xuyen district, Ha Tinh province. Using Spatial Analyst and Network Analyst, the results of the study are not only location of safe destinations for migration but also defining the shortest and fastest way to move from flooding areas to secure facilities. In this study, we set up three scenarios: one destination for each commune (base scenario), one improved scenario (3 facilities) and another one with a new constructed facility site. This will be important information to helps residents in flooding areas and disaster managers to make better strategic decisions, reduce transportation costs, casualties and damages.

Keywords: GIS technology, emergency plan, Cam Xuyen District.

THE EVOLUTION OF SALINITY INTRUSION AT MEKONG RIVER MOUTHS UNDER THE IMPACTS OF UPSTREAM DAMS

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Abstract:

The evolution of salinity intrusion at Mekong river mouths has been occurring more complicated and significantly affecting the livelihood and sustainable development in Mekong River Delta (MRD). Located at the very end downstream of Mekong River (MR), MRD is strongly affected by the development of reservoirs and hydropower dams in the main stream as well as tributaries. Based on analyzing the serial data of flow at Kratie, Tan Chau - Chau Doc and measured salinity concentration data at river mouths corresponding with each stage of dam implementation along the main stream of Upper Mekong in China, how the change of total discharge in flood and dry seasons affecting salinity intrusion evolution was elucidated. The correlation between the discharge to MRD during dry season and salinity concentration measured at 4 stations in 4 river mouths respectively thereafter was established in order to better understand the trend of salinity intrusion at Mekong river mouths.

Keywords: Hydropower dam, Mekong River Delta, Reservoir, Salinity intrusion

CHARACTERISTICS OF SEAWATER INTRUSION IN COASTAL REGION OF THE VIETNAMESE MEKONG DELTA

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Abstract:

In recent years, seawater intrusion has resulted in many problems for socio-economic development in the Vietnamese Mekong Delta, especially in the coastal areas. Therefore, understanding characteristics of seawater intrusion is critical to sustainable water resources management. In this study, the integration of hydrogeochemical and stable isotopes, as well as geochemical modeling were used to investigate seawater intrusion process and its controlling factors. The results revealed that seawater intrusion affects strongly on surface water quality with different magnitudes, depending on seasonal variation and tidal regime. It was estimated that surface water mixing with approximately 29.5% and 4.12% of seawater in dry season and rainy season, respectively. Upstream discharge plays very important role in preventing seawater intrusion into surface water system along the coast with contribution ratio to more than 60% of coastal surface water. In rainy season, the magnitude of seawater intrusion in surface water system was decreased due to increase upstream and local rainfall-runoff flow which contribute to 68% and 28% of coastal surface water, respectively. Conversely, salinity of groundwater showed less seasonal variation and distributed heterogeneously following depth of screened wells and distance to the sea. The mixing ratio between seawater and groundwater varied widely, ranging from less than 10% in DGW1, DGW2 and DGW4 aquifers up to maximum of 38% in SGW and DGW3 aquifers. The main factors

controlling seawater intrusion into surface water system were very complicated, including upstream discharge, tidal regime and operation of sluice gates. Meanwhile, seawater intrusion into the coastal aquifer system may govern by geological characteristics, original recharge sources, human intervention and natural variation, especially excessive groundwater exploitation and climate change. Therefore, the integrated sustainable groundwater and surface water use and management strategies in the Mekong Delta are needed in the context of human-nature intervention.

Keywords: Water salinization, hydrogeological processes, Mekong Delta, Soc Trang.

INVESTIGATION OF HOUSEHOLD POLLUTION LOADING: A CASE STUDY IN URBAN AREAS OF HANOI, VIETNAM

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Abstract:

Untreated household wastewater in developing countries, including greywater and septic tank effluent,t is mostly discharged directly into local receiving waters causing serious water pollution. This study investigated pollution loading caused by untreated household wastewater in urban areas of Hanoi, Vietnam. The hourly pollution loading from household wastewater was estimated by hourly water consumption rates and at-source wastewater concentrations. The pollution loading accumulated in river water was monitored hourly at an inlet and outlet of a river, where the household wastewater was discharged into. The results showed that the biggest peak of hourly water consumption were observed at the evening (5-11 PM) whereas that of hourly pollution loadings happened during daytime (9 AM-4 PM). Discharge from all households accounted for only 21% of total flow rate of the river but contributed 54, 47, 40 and 25% of the loadings, respectively for COD_{Cr}, BOD_5, TP and TKN. Treatment efficiency of the septic tanks was limited as the system was able to only trap particulate matter. Therefore, large parts of COD_{Cr}, BOD_5, and TKN in the household wastewater, mainly in soluble matter, were discharged into the river. These data provide fundamental understanding for the future development of wastewater management strategy in urban areas.

Keywords: Household wastewater; pollution loading; river pollution; Vietnam; watershed.

REMOVAL OF ORGANIC POLLUTANTS FROM INDUSTRIAL WASTEWATER USING FENTON PROCESS

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Abstract:

The fenton process is one of the most studied advanced oxidation processes, due to its efficiency, low reaction time and easy application. In the present study, fenton process is used to remove the organic pollutants from industrial wastewater. The process parameters like pH and reaction time were studied using 1:10 ratio of $FeSO_4$ and H_2O_2 with a 500ml working volume of sample. The optimum conditions were found at pH 7 with a reaction time of 180 min. Finally, chemical oxygen demands (COD) and chlorides, before and after fenton process were measured to ensure the entire destruction of organics during their removal from industrial wastewater. The experimental results shown that the fenton process effectively achieved removal efficiency of 80%.

Keywords: Industry wastewater, Fenton process, Chemical oxygen demand (COD), chlorides.

FLOOD FORECASTING IN THE MA RIVER - CURRENT STATUS AND PERSPECTIVE

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Abstract:

At present, flood forecasting for the Ma River system is carried out by forecasting offices under the Hydro-Meteorological Administration in accordance with daily flood forecasting and warning process in the year including of the National Center for Hydro-Meteorological Forecasting (NCHMF) and Regional Hydro-Met Center for the North Central of Viet Nam. In operation, hydrological models as NAM and TANK hydrological models have been applied for the upper and middle reaches of the river, and combinated with regression equations to the calculate downstream areas, where as influence of tide.

The article summarizes and evaluates the forecasted results for major flood occured during the last years. Based on forecast result evaluating and analyzing, orientation research in order to improve forecast results for the main positions on the Ma river will be presented and discussed arccoding to extanding forecast lead time and expanding forecast areas.

Keywords: Ma river basin, Regression method for flood forecast, NCHMF.

PREDICTION OF FIRE IN CHINA BASED ON ARIMA MULTIPLICATIVE SEASONAL MODEL

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Abstract:

The occurrence of fire hazards is random, belonging to the category of dynamic time series, while the time series analysis method is good at making statistical analysis of dynamic data and predicting it. This paper establishes an ARIMA (Autoregressive Integrated Moving Average) multiplicative seasonal model through data preprocessing, model identification, parameter estimation and diagnosis, based on the data of number of fire hazards from 2000 to 2014 in China. Then the model is tested, and the result shows that the fire prediction model is appropriate. Finally, the data of fire numbers from January 2015 to December 2016 are predicted by the fire prediction model. As a result, the fire prediction model, whose prediction accuracy is high, provides a scientific basis for fire prevention in the fire department.

Keywords: Fire hazards prediction; ARIMA model; Multiplicative seasonal model.

MONITORING LAND COVER IN COMPLEX LANDSCAPES USING SATELLITE IMAGERY: ENHANCED CLASSIFICATION ACCURACY BY COMBINING HIGH RESOLUTION REMOTELY SENSED DATA

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Abstract:

Understanding of land cover change is essential for an intensive range of studies on earth system science. In order to accurately produce land cover maps in heterogeneous landscapes, multi-temporal or/and multi-spectral images have been used, but the availability of data can be limited because of substandard acquisition agenda, cloud cover, and limits on data archive. Such issues may be solved by integrating high-spatial-resolution data from Sentinel 2, Advanced Visible and Near Infrared Radiometer type 2, Landsat 5, 7, and 8 and ancillary data including STRM30, Suomi National Polar-orbiting Partnership and OpenStreetMap road network. With these data, this study applied a kernel probabilistic classifier based on Bayesian probability to detect land cover changes from 2007 to 2017 in Thua Thien Hue province, Vietnam. The area was classified into water, urban area, paddy, grassland, orchard, forest, and mangrove classes. Results show that the province covers an estimated area of 4,900 square kilometers with 87 % being vegetated areas and the other being water, urban and bare areas. Over ten years, inland water, urban, and crop regions increased by 133, 33, and 58 km^2 respectively while paddy and mangrove fields witnessed a slight decrease of approximately 25 km^2. Interestingly, while forest area significantly grew by 186 km^2, orchard, bare land and grassland together fell by over 100 km^2. These changes threat to a severe problem for resources management, especially watershed management.

Keywords: Landsat, Sentinel, High resolution, Multi-sensor, Multi-temporal and Image classification.

PHYTOREMEDIATION OF AQUACULTURE WASTEWATER USING CYPERUS ALTERNIFOLIUS AND NEPTUNIA OLERACEA AQUATIC PLANTS

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Abstract:

This study detected the reduction of nitrogen compounds in aquaculture wastewater by using Neptunia oleracea and Cyperaceae alternifolius. Four experiments in doublicate were set up and distributed in control, Neptunia oleracea, Cyperaceae alternifolius and combine experiments. The following analyses were measured every ten days: nitrite, nitrate, ammonia, total nitrogen, total carotenoid and number of cell.

After 20 days, for Cyperaceae alternifolius, nitrite concentration was reduced by 76% (5 to 1.2 µg/mL), nitrate concentration by 17% (37.8 to 31.5 µg/mL). For Neptunia oleracea and combine two plants, NO2- reduced % and %, respectively, and NO3- reduced % and %, respectively. For Amonia and total nitrogen, there were no different between plants eperiments compare with control. After 20 days, total carotenoid concentration and number of cell increased in three plants experiments, while remained stable in the control experiment. There was clear that plants producing better micro-environment for algae growth. Number of cell increased in three plants experiments. It provided that plants contributed the increasing in number of cell; because of divert microorganism in rhizosphere. The result indicated that Cyperaceae alternifolius could absorb nitrite and nitrate better than Neptunia oleracea, and two plants could not enhance the absorption of nitrite and nitrate than individual in aquaculture wastewater.

Keywords: Neptunia oleracea, Cyperaceae alternifolius, combine two plants, nitrite, nitrate, ammonia, total nitrogen, total carotenoid, number of cell

RIVER WATER QUALITY MODEL INPUT UNCERTAINTY QUANTIFICATION BY MEANS OF CORIWAQ-RS MODEL

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Abstract:

River water quality modelling is an essential part of modern river basin management. Next to the incomplete knowledge on the water quality processes, lack of pollution input data is known as one of the major uncertainty sources. Model improvement hence should focus on obtaining more information about the input/boundary conditions. Given that there are so many pollutant sources along a river, model improvement actions should focus on the most important sources to optimize the cost-benefit ratio of the actions. To reach this goal, this research identified and propagated the model input uncertainties for the case of the Molse Neet river in Belgium, considering organic and nitrogen pollution. For computational reasons, a fast, efficient Conceptual River Water Quality (CORIWAQ) model was applied. Input uncertainties were modelled by the stochastic regression approach, i.e. adding time series of randomly generated errors to the estimated input time series by means of regression equations. Based on sensitivity indices related to the model output error variance, the importance of the agricultural, industrial and domestic pollution sources was identified.

Keywords: river water quality; pollution sources; model input uncertainty; sensitivity analysis; missing data.

LOW-COST ADSORBENT MATERIAL MODIFIED FROM RED MUD FOR REMOVAL OF LEAD FROM AQUEOUS SOLUTION

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Abstract:

Red Mud (RM), a tailing product from Alumina industry caused adverse impacts to human activities and agriculture. This study attempts to convert RM into inexpensive and efficient adsorbent materials for remove lead from aqueous solution. RM in different treatments by temperature or by adding with natural zeolite, aluminum, and base has different range of adsorption capacity (49.26 mg/g- 59.88 mg/g). Adsorption of lead is studied as a function of contact time, particle size, pH and initial Pb concentration. The Freundlich and Langmuir models are fitted the experimental data. The aqueous solutions applied over a wide range of initial metal ion concentrations (50mg/L -1000mg/L) with efficiency is 97%-40% respectively.

Keywords: Red Mud, low-cost adsorbent material, Lead removal, adsorption, and activation

EVALUATION ABILITY OF MYCOFILTRATION TO TREAT AQUACULTURE WASTE WATER

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Abstract:

Aquaculture wastewater caused many environment problems such as pathogen and eutrophication. This study assessed the efficiency of new approach –mycofiltration to treat aquaculture wastewater, practically to remove of Escherichia coli and Chemical Oxygen Demand, Total Nitrogen, Total Phosphorus. Fungi were collected in nature and market sources and transferred mycelium to substrate with 100% rice husk to form mycofilter. Among 6 isolated fungal species, two unknown white rot fungi UN1 and UN6 had significant removal of E. coli in liquid medium, with the initial amount of E.coli 1000 - 2000 CFU/100ml and after 4 and 8 hours of incubation. Mycofilter UN1 and UN6 were then evaluated the capacity of removing total bacteria and COD, TN, TP. Mycofilter UN6 had the best performance in bacteria removal with 85.9%.

Key word: Mycofiltration, Wood rot fungi, Escherichia coli, Wastewater

PARAMETER SENSITIVITY ANALYSIS FOR A COASTAL PHREATIC AQUIFER

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Abstract:

The exacerbated pumping of groundwater from coastal aquifers has resulted in an inversion of the groundwater flow from the sea towards the interior, causing seawater to intrude. Under this circumstance, it is important to understand dynamics between groundwater flow and seawater intrusion (SWI) in coastal aquifers. A numerical model can be used to understand these dynamics. One of the important inputs in numerical modeling are aquifer parameters which are mostly unknown, therefore, it is essential to identify the most significant parameters that affect the SWI process. For the present sensitivity analysis, a coastal aquifer which is approximately located 16 km from Mangalore city, west coast of Karnataka, India is considered. The areal extent of the aquifer is about 8 km^2 and the aquifer is bounded by the Arabian Sea on the west, the tidal river Pavanje in northern and landward boundary on other parts. The conceptual unconfined aquifer model is developed by constraining with field data such as layering and appropriate boundary conditions. Based on the earlier study on borehole logging, the conceptual model is divided into 5 layers and thus a reasonable range of model input aquifer parameters is known. The sensitivity analysis is performed on input model parameters such as anisotropic hydraulic conductivity, specific yield, effective porosity and dispersivity coefficient. From relative ranking from sensitivity index, it is evident that dispersivity and hydraulic conductivity are the most sensitive coastal aquifer parameters to evaluated SWI. The effective porosity and specific yield do not influence the groundwater flow and SWI significantly over steady-state simulation. Root Mean Square Deviation (RMSD) is used to quantify the amount of output deviation from the initial model output. Similar results into sensitive and less sensitive parameters are obtained with to sensitivity index and RMSD.

Keywords: Aquifer parameters, Coastal aquifer, Numerical model, Sensitivity analysis.

APPLICATION OF A 3D MODEL TO STUDY ON SEDIMENT TRANSPORT IN THE DONG NAI RIVER IN BIEN HOA DISTRICT

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Abstract:

The 3D-numerical model has been applied to simulate the sediment transport in the Dong Nai River in Bien Hoa district. The model was simulated to analyze the effect of tidal current and river discharge under the influence of river management works. A sediment transport model – MIKE 3 Sand Transport (ST) - is used to find the movement of sediments along the Dong Nai River in Bien Hoa district. MIKE 3 ST is interfaced with the hydrodynamic module, MIKE 3 Flow Model (FM), which simulates the water level variations and flow in response to a number of forcing functions. The results help to understand the sediment transport along the Dong Nai River and to analyze the impacts of buildings on riverside. This approach can lead to carry out a model possible to properly simulate the behavior of physical processes within the river bed with the impact of buildings on riverside.

Keywords: Dong Nai River, sediment transport, river management works

A DEEP NEURAL NETWORK APPLICATION FOR FORECASTING THE INFLOW INTO THE HOABINH RESERVOIR IN VIETNAM

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Abstract:

The ability to predict the inflow rate is important for assuring effective dam operation and downstream flood control. Accurate forecasting of peak flood is essential for preventing lowland flooding and mitigation of socioeconomic damages. Thus, most of the existing inflow forecast methods utilize hydrological models, which require a large number of input data; at the same time, the predictive ability of these models is quite low, owing to various uncertainties. In recent years, deep neural networks (DNNs) have been used in many fields for data forecasting. In this study, a simple and efficient model based on a long short-term memory (LSTM) DNN is suggested as a replacement of traditional rainfall-runoff models. The proposed model uses the TensorFlow open source software library, which is often used in complex machine learning and DNN applications. However, this framework is sufficiently general and can be applied to hydrologic forecasting as well. The Hoabinh reservoir in Vietnam was chosen as a study subject, and the LSTM-based model was applied for predicting the reservoir's inflow for 6 hours, 12 hours, and 18 hours of lead time. The collected input data were the observed data in 2009 from six hydrological stations, among them five upstream stations and the forecasting - target station (Ta Bu). Although the model requires only modest amount of data (compared with geographical, land-use, and geological data that are often required for rainfall-runoff simulations), the predictive ability is quite impressive: the Nash-Sutcliffe efficiency (NSE) reaches 99.9% and the root mean square error (RMSE) is only ~6.8 m^3/s. This result implies that the proposed LSTM-based model is adequate for forecasting the reservoir inflow and can replace traditional hydrologic models for practical flood forecasting.

Keywords: LSTM, Hoabinh reservoir, discharge prediction, deep learning, neural network.

IMPACT OF SEASONAL OPERATION BY WASTEWATER TREATMENT PLANT ON WATER QUALITY OF COSTAL WATER AREA

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Abstract:

Ariake sea, where Saga lowland is faced, is known as semi closed water area. Therefore, government have tried to prevent water pollution due to eutrophication. Especially, wastewater treatment plant (WWTP) along costal of Ariake sea remove not only BOD but also nutrient. However, the demand of nutrient from seaweed cultivation become high extremely in the winter season between November to March. Concentration of dissolved inorganic nitrogen in sea water reach to zero on December to January every year because seaweed uptake it. Then, farmers distribute fertilizer (ammonium and nitrate) to promote cultivation of seaweed. Considering these backgrounds, WWTP in Saga city have tried to apply new type of operation which treatment conditions are changed based on season. It is called seasonal operation. In summer season, WWTP apply the operation to promote nitrification by increasing aeration amount. On the other hands, aeration is decreased to prevent nitrification and to discharge high concentration of ammonium as treated wastewater in winter season. Discharged ammonium contribute to make seaweed grow in coastal area. However, it is not found clearly yet how discharged ammonium is diffused, accumulated and consumed in water bodies. And there is possibility that typical tidal river near WWTP which can see in lowland is affected by discharge treated wastewater. In this study, water quality of water bodies at downstream of WWTP was discussed using monitored water quality parameter to grasp impact of seasonal operation in WWTP.

It was pointed out that treated wastewater was diffused at surface layer, make a spread gradually in Ariake sea. After that, it is mixed gradually by tidal change. Treated wastewater was transported from the discharge point to the upstream when tidal level is risen. Therefore, quality of water bodies and bottom sediments at upstream is affected by treated wastewater.

Keywords: seasonal operation, Wastewater treatment plant, Eutrophication, nutrient, monitoring

DISSIPATION HALF-LIFE OF PROPICONAZOLE IN WATER AND ITS REMOVAL EFFICIENCY BY HORIZONTAL SUBSURFACE FLOW CONSTRUCTED WETLAND

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Abstract:

Propiconazole is a fungicide popularly applied for controlling fungi in agricultural production. This pesticide is however rather persistent in the environment and classified as a moderately toxic substance to aquatic organisms. In this study, an experiment on dissipation half-life of propiconazole in water was conducted in the equalization tank of a pilot model of waste treatment system. Water samples were collected and determined the concentration of propiconazole in the periods of 1, 2, 3, 5, 9, 17, 33, 44, 66 days after spiking an amount of the substance into the tank. The removal efficiency of propiconazole residues from water by the pilot model of horizontal subsurface flow constructed wetland system cultivated with Phragmites sp. was also carried out. Two surface hydraulic loading rate of 600 $L.m^{-2}.day^{-1}$ and 1000 $L.m^{-2}.day^{-1}$ were experimented on the system, respectively. Water samples were collected at the input and output of the system for determining propiconazole residues. Results of the dissipation half-life experiment revealed that the concentration of propiconazole rapidly declined in the early days and slowly decreased in late days. Dissipation half-life of propiconazole in water was estimated of 12.8 days. Removal efficiencies of propiconazole from water were 85.2% and 70% for surface hydraulic loading rates of 600 $L.m^{-2}.day^{-1}$ and 1000 $L.m^{-2}.day^{-1}$, respectively. Application of constructed wetland with horizontal subsurface flow for removing agricultural chemicals from water needs to be studied more in the future.

Keywords: constructed wetland, dissipation half-life, propiconazole, surface water.

ANALYSIS OF THE CURRENT STATUS OF WATER QUALITY AND CAPACITY TO SUPPLY WATER TO THE INNER RIVERS OF HANOI CITY

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Abstract:

Water quality is a significant issue especially in developing countries like Vietnam but it has not received adequate consideration. As a result, we are facing the most serious problem, namely "water pollution". In Hanoi, water pollution occurs in all rivers including: Day, Nhue, To Lich Rivers. Currently these rivers are receiving large amounts of residential garbage, waste water, along with sewage from urban areas, industrial zones without treatment. Although wastewater treatment plants have been built to treat polluted water, however, it is still in serious pollution.

This paper presents the current status of water quality in the inner rivers of Hanoi city and analyse the capacity to supply water to them to improve water self purification and water quality.

Keywords: water pollution in Hanoi, To Lich River, river pollution, water quality.

OPTIMIZATION OF HETEROGENEOUS ELECTRO FENTON PROCESS FOR PESTICIDE WASTEWATER TREATMENT

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Abstract:

In this study, Heterogeneous Electro Fenton (HEF) system was applied to treat pesticide wastewater. Fe3O4-Mn3O4 synthesized by co-precipitation method was used as a catalyst which can be easily separated and recycled by magnetite. Three operating factors significantly affected the HEF process are voltage, pH, and catalyst dosage. Preliminary experiments showed that at voltage from 15 – 25 V, pH from 6 – 8, and catalyst dosage in the range of 0.2 – 0.6 g/l, the optimum treatment condition could be found. Modde 5.0 software was used to design a second order experimental plan and find a mathematical model for these factors with COD removal efficiency response. Results from the mathematical model showed that at voltage of 20.8 V, pH of 7.3, and catalyst dosage of 0.451 g/l, the treatment reached its optimum condition, where COD removal efficiency was 95.8 % corresponding to COD in the effluent of 113 mg/l. A real test was carried out for the treatment at the predicted optimum condition, result indicated that the experimental value was very similar to its predicted value. Moreover, COD in the effluent met well the QCVN 40:2011/BTNMT (Column A).

Keywords: Heterogeneous Electro Fenton; pesticide wastewater; response surface methodology; Box Benhken.

ESTABLISH LANDSLIDE SUSCEPTIBILITY MAPPING IN SON LA PROVINCE, VIETNAM BY USING GEOGRAPHY INFORMATION SYSTEM AND ANALYTICAL HIERARCHY PROCESS

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Abstract:

Landslide is one of typical natural disasters risk and potential danger in the Northern Mountains of Vietnam when rainy season comes. There are many methods to identify landslide susceptibility zone. Among them, the method combining Geography Information System (GIS) and Analytical Hierarchy Process (AHP) produces reliable and accurate result. AHP is a semi-quantitative method that is used to determine the weights for input factors. With AHP, an inventory map of 1210 landslides which were produced based on the historical data and interpretation on aerial photograph was used to compute the factor maps. Eight factors are given to calculate including Slope, Average Annual Rainfall, Soil type, Distance from roads, Drainage density, Stream density distribution, Land use and lineament. After determining the weights for each factor and overlapping, the landslide risk map in the whole areas is obtained. The landslide risk map was classified into 5 levels including very high, high, medium, low and very low. Very high and high-risk areas are mainly occurred in the districts Quynh Nhai, Yen Chau, Thuan Chau and Moc Chau. Low risk areas are mainly distributed in low - sloping areas such as Sop Cop, Song Ma. The outcome can be used for the proactive solutions of adaption and mitigation of the impacts. The result also reserves the purpose of rational land use planning.

Keywords: Landslide, AHP, Son La, GIS.

LONG-TERM ANALYSIS OF WATER QUALITY IN TH TERAUCHI RESERVOIR AND DISCHARGED LOADING FROM ITS CATCHMENT AREA

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Abstract:

Water resources development project such as construction of dams and related infrastructures is often conducted at upstream in order to maintain the stable water intake and conserve river environment in the lowland. The Terauchi Dam is a multi-purpose dam constructed under the Comprehensive Water Resources Development Plan of the Chikugo River System. Operated by the Japan Water Agency since 1978, this dam provides water for irrigation, water supply and conservation of river environment in the lower reach of the Chikugo River. Eutrophication problems in the reservoir of the Terauchi Dam, so-called the Terauchi Reservoir, have been reported since the beginning of dam operation. Several measures including the installation of aerating circulation facilities have been conducted to deal with eutrophication problems. Since water quality problems in the reservoir can have a great impact on activities and ecological system in the lowland, this study aims to analyze long-term changes of water quality in the Terauchi Reservoir and its relationship with inflow loading from the catchment area. Effect of aerating circulation facilities was also considered in the analysis. Water quality data of the reservoir indicated that Chlorophyll-a, suspended solids and nutrients of surface layer had declined in 2004 - 2014 and confirmed that aerating circulation facilities can suppress algal growth in the Terauchi Reservoir. According to long-term change of runoff pattern, water retention capacity of the catchment was rising and resulted in lower SS loading and T-P loading into the reservoir. Further study on the change in characteristics of runoff from the catchment area is necessary. Calculated results from the

finite volume model indicated that water quality in the Terauchi Reservoir in recent 10 years was mainly influenced by inflow loading while effect of algal productivity on water quality in the reservoir was reduced by aerating circulation facilities. From this study, control of nutrient loading at the level of catchment such as runoff control by forest is recommended for water quality management in the reservoirs and lakes.

Keywords: water quality, loading, eutrophication, Terauchi Reservoir, Chikugo River.

FLOOD RISK ASSESSMENT IN THE TRA BONG RIVER CATCHMENT, VIETNAM

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Abstract:

Extreme flood events often cause tremendous damage and enormous risks to our life and nature. Flooding is one of the most costly kinds of natural disasters in Vietnam. Tra Bong is a river catchment located in Quang Ngai province, Vietnam. Due to the effect of typhoons originated from the East Sea, many extreme floods occur in this river annually. Therefore, considering the impacts of flooding and flood risk assessment in this river plays an important role in mitigating and adapting to flood risk. In this paper, a hydrological model (MIKE NAM) and some hydro-dynamic models such as the MIKE 11 HD, MIKE 21 FM and MIKE Flood models were applied as the effective tools to simulate flooding and inundation in the downstream area of the catchment. Two flood risk maps for 2009 and 100 year return period were created based on the intersection of hazard and vulnerability maps which were obtained from flood maps, land-use and population density. Accordingly, more than 80% of total flooded area is at high and very high risk. Almost 35 km2 of the flooded area were under high and very high risk in the year 2009, while, approximately 45.5 km2 would be under high and very high risk in the design flood event of 100 year return period.

Keywords: Tra Bong river catchment, Flood hazard, Flood vulnerability, Flood risk assessment, MIKE models

ASSESSING THE SPATIAL DISTRIBUTION OF RIVER WATER QUALITY IN THE CAN GIO MANGROVE FOREST

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Abstract:

The Can Gio mangrove forest, located in Ho Chi Minh City in Vietnam, has been an important environmental conservation focus for this region. Over time, the Can Gio mangrove forest has been negatively affected by erosion and environmental degradation caused by climate change and human activities. In this region, the Soai Rap and Long Tau Rivers, located at the downstream end of the Saigon River Basin, significantly affect the hydrodynamic regime of their subbranches. As such, the water quality of the Soai Rap and Long Tau Rivers directly affects the environmental health of the Can Gio mangrove forest. In this study, we used different technologies to assess the water quality along the Soai Rap and Long Tau Rivers based on various water quality indices including dissolved oxygen (DO), oxidation reduction potential (ORP), turbidity, pH, and salinity. These indices were measured continuously using commercial sensors and data loggers attached to the side of a moving boat and were combined

with water depth and geographic information system (GIS) location data. Additional salinity data was collected using commercial data loggers for an extended time at upstream (Phu Xuan) and midpoint (Nga Bay) locations in the Can Gio mangrove forest, and salinity profiles were developed at select points along the Soai Rap and Long Tau Rivers. Field results indicated that several water quality indices varied by spatial location. The DO ranged from 4.90 to 6.46 mg/L, depending on river location. Similarly, the pH was consistently higher than 6.90 but differed between primary and secondary river locations. The salinity also differed considerably, depending on the river cross section, river depth, and distance to the sea. Conversely, the ORP and turbidity did not differ by location but were instead affected by the river's flow conditions and human activities.

Keywords: River water quality, oxidation reduction potential, dissolved oxygen, pH, salinity, turbidity

REGIONAL DROUGHT MONITORING AND ANALYZING USING LANDSAT 8 DATA - A CASE STUDY IN NINH THUAN AND BINH THUAN PROVINCES IN 2016

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Abstract:

Drought monitoring is essential in order to maintain food security in Vietnam, particularly in Ninh Thuan and Binh Thuan provinces. These two provinces suffered from a severe drought in 2016. Compared with traditional approach for drought monitoring, remote sensing approach has more advantages due to its almost real-time and large covering area characteristics. In this paper, Normalized Vegetation Supply Water Index (NVSWI) and Vegetation Health Index (VHI) were used to detect the drought condition utilizing Landsat 8 Data in Ninh Thuan and Binh Thuan provinces in March 2016. These indices are calculated by the approach combining reflectance and thermal channels. The NVSWI is calculated by the combination of Normalized Difference Vegetation Index (NDVI) and Land Surface Temperature (LST), while the VHI is calculated by the combination of Vegetation Condition Index (VCI) and Temperature Condition Index (TCI). The results showed good agreement with the drought status monitored and issued by the National Meteorological Bureau. It indicated that Thuan Bac and Tuy Phong districts in Binh Thuan province and Bac Ai, Ninh Phong and Ninh Son districts in Ninh Thuan province are the areas which have huge drought damage in 2016.

Keywords: Drought monitoring, Landsat 8, NDVI, LST, NVSWI, VHI, Ninh Thuan, Binh Thuan

RESEARCH ON CONTRIBUTION RATIO OF LARGE UPSTREAM RESERVOIRS FOR MINIMUM FLOW IN VUGIA-THUBON RIVER SYSTEM

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Abstract:

Hydropower development in the upstream have a great impact on downstream flows. According to the Operating Procedure of Reservoir System (OPRS) in Vu Gia - Thu Bon river basin, four large upstream reservoirs must discharge certain flow during dry season to increase water levels at downstream hydrological stations named Ai Nghia and Giao Thuy. These stations were used as the control points for the downstream water supply. This study seeks reasonable minimum discharging flows of reservoirs to maximize total electricity production and to ensure minimum flow at downstream as required. An integrated river basin model was developed in Excel and solved by Crystal Ball Optquest. Thousand combinations of the reservoir inflows were generated by Monte Carlo simulation, considering the correlation between tributaries. Then, the scatter search algorithm available in the Optquest module was used to find the optimal outflows from the reservoirs. The optimizing-simulation based results show that the current OPRS can be improved for more efficient water resources management.

Keywords: reservoir system operation, Crystal Ball Optquest, optimization, Monte Carlo simulation.

ASSESSMENT OF WATER SHORTAGE IN SESAN RIVER BASIN BY INTEGRATING THE SWAT AND WEAP MODELS

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Abstract:

Water scarcity is a widespread issue in many parts of the world. Assessment of water shortage in various conditions is very essential for effective water resources management in basin scale. This study aims to estimate the water shortage in dry year, wet year and 2015/16 year which is reported as the most damaged year due to drought in the last ten years in Sesan river basin. SWAT model was used to identify the surface water potential and the WEAP model was used to distribute these water sources in order of priority to different subjects for water use. These models were calibrated and validated to have a good agreement between simulated and observed inflow discharge. The results showed that the water shortage happened mostly in sub basin SS19, SS20 and SS22, in the area of Ia Grai, Pleiku, Dak Doa and Chu Pah district. The amount of water shortage are 20.81 million m3/year, 10.81 million m3/year and 25.19 million m3/year in dry year, wet year and 2015/2016 year, respectively. Sesan basin always has water shortage, even in a wet year due to its irregular distribution of water demand.

Keywords: Water shortage, water resources management, SWAT, WEAP

CROWDSOURCING AND APPLICATION IN CRISIS MANAGEMENT IN VIETNAM

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Abstract:

Recently, we have witnessed an increasing number of crises, not only the natural disasters (e.g. Hurricane Katrina, Haiti earthquake, Tōhoku earthquake and tsunami…) but also the man-made ones (e.g. Arab Spring, Syrian refugees' crisis in Europe, rioting in Baltimore…). In such crisis, the task of collecting related data plays an urgent role helping to reduce the impact of the crisis in the during, after or even before period. The useful crisis data might be provided by the people living around the affected area via SMS messages or social networks (e.g. Twitter, Facebook, YouTube…) or even other disaster management systems operated by humanitarian organizations. This paper introduces some crowdsourcing platforms supporting to collect crisis-related data from eyewitness and also a deployment in Hanoi, Vietnam.

Keywords: Crowdsourcing, Crisis management, Risk management, Decision support system.

DEVELOPMENT OF A HYDRO-ECONOMIC MODEL FOR OPTIMIZING WATER ALLOCATION IN BA RIVER BASIN

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Abstract:

The study of hydro-economic models in Vietnam started lately, but not widely. The hydro-economic models are different from traditional hydrological models by taking additional consideration of "varied" water values. In this paper, the valuation of two main water users agriculture and hydropower were obtained. An integrated water allocation model was developed for Ba river basin in GAMS (General Algebraic Modeling System). In general, this is the optimal model with the objective function of total economic value. In the model, the river basin system was simulated as nodes and links. The allocated flows to different water users are decision variables. Many scenarios were built under different conditions of flows, economy, society and environment. The applicability of model for these scenarios show its high flexibility. From the calculation result, the correlation between the economic benefit and the flow of the Ba river basin has been established. Some specific measures to improve water use efficiency have also been analysed in the paper.

Keywords: hydro-economic model, water allocation, GAMS, optimization, Ba river basin.

THE COMPUTATION OF HYDRAULIC CHARACTERISTICS OF FLOOD FLOW DOWNSTREAM FROM THE RESERVOIR WITH DAM SAFETY SCENARIOS IN NORTH VIETNAM

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Abstract:

Using a reservoir is an effective solution to prevent lowland flooding and mitigate socio-economic damages. However, due to the high density of river network and the presence of reservoirs, dam safety assurance is becoming one of the most important mission in water resource management in Vietnam. Hydraulic characteristics of dam-break wave are necessary information to generate early warning plans for downstream area of reservoir. To aim this purpose, the Finite Volume Method with Godunov-type is considered to solve two-dimensional shallow water equations and develop a numerical model. In this study, the numerical model for dam-break simulation is suggested and verified through a comparison between calculated results and observed data of two reference tests. Very good agreement shows the effectiveness and accuracy of the proposed model. The Nam Chien reservoir in Vietnam has been chosen and the numerical model is applied to simulate flooding wave for the scenario of arch dam collapse. Alternative solutions are produced, such as: water depth, discharge hydrographs, arrival time, time to reach maximum water level; flooding map. The simulated result implies that this model is an indispensable tool for simulating dam-break scenarios.

Keywords: Arch dam, flood propagation, numerical model.

NUMERICAL MODELLING OF FLOW IN THE TONLE SAP BY MEANS OF A DISCONTINUOUS GALERKIN FINITE-ELEMENT MODEL

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Abstract:

The Tonle Sap Lake, which is located in the Cambodian floodplain of the Mekong River System, plays an important role for storage and water supply in

Cambodia as well as in the low land region of the Mekong River System. Every year the lake stores water in the flood season from May to October while it acts as a spillway providing water to the Mekong Delta in the dry season from November to April. In other words, the lake depth can rise by approximately 10 m and the water volume can increase 5 times during the year, showing various drying and wetting areas in the lake and its adjacent floodplains. In terms of hydrodynamic modelling, these wetting/drying areas are still challenging because of several difficulties, e.g. large CPU time, slow transition of wet-dry interface and, possibly lack of mass conservation. In this paper, we present a wetting - drying algorithm with a limitation for the fluid depth and a blending parameter in order to ensure local mass conservation and rapid transition of a wet/dry interface. The technique is firstly implemented in the framework of the Second-generation Louvain-la-Neuve Ice-ocean Model (SLIM). Then, it is validated by means of the analytical Balzano 1, Balzano 3 and Thacker test cases, showing its well-balancing property. Finally, it is applied to the simulation of the flow in the Tonle Sap and its neighborhood.

Keywords: Mekong, Tonle Sap, Wetting - drying algorithm, SLIM.

A STUDY ON THE WATERSHEDS' CHARACTERISTICS AND INFLUENCE FACTORS OF THE 2017 NORTHERN KYUSHU TORRENTIAL RAIN DISASTER

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Abstract:

A torrential rain in Chikugo River basin's middle stream area on July 5-6, 2017 caused enormous disasters in Fukuoka Prefecture and Oita Prefecture. Generated sediment and driftwood due to the torrential rain gave heavy damages to many small tributaries' watersheds. In this paper, various information is analyzed, such as geological aspect, land use aspect, hydrological aspect, etc. of damaged areas by using GIS to estimate the influence factors of the 2017 Northern Kyushu torrential rain disaster. Moreover, 2D distributed runoff models are applied to these watersheds to simulate runoff and inundation processes. As a result, each watershed's hazard characteristics is categorized and discussed.

Keywords: Chikugo River basin, torrential rain, generated sediment, generated driftwood, GIS, distributed runoff model.

UNDERGROUND WATER RECHARGE MODEL FOR CENTRAL AND CENTRAL HIGLAND OF VIET NAM

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Abstract:

There are available methods and schemes for underground water recharge applied in Vietnam such as recharge from riverbed, or collecting rainwater on the roofs and so forth to fed the aquifers. However, those methods and schemes show limitation when applying for rural places located in Central Region and Central Highlands of Vietnam. A new water recharge systems is proposed by the authors and recently applied in Binh Thuan Province. This paper introduces details of the systems and initial data monitored from the field.

Keywords: water recharge, water supply, underground water, water scarcity, Central Region and Central Highlands of Vietnam.

CONTRIBUTION OF INDIGENOUS KNOWLEDGE TO ADAPT TO FLOODS IN MEKONG DELTA, VIETNAM (Case study in An Phu, Chau Thanh, Tri Ton districts, An Giang province)

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Abtract:

This research was carried out to systematize and assess the appropriateness of farmer's indigenous knowledge and their adaptive capacity with floods. The research aimed at providing scientific foundation for proposing solutions to conserve and enhance the effectiveness of valuable indigenous knowledge in reducing vulnerability of people living in flooded areas. The results showed that local people are using several effective indigenous knowledges for coping with floods. However, the valuable indigenous knowledge has not recorded yet, nor documented in written materials for sharing to young generation and communities. Besides, some indigenous practices are not suitable in practice which required reevaluation for current flood adapation strategies. The research suggested some solutions to conserve the most valuable indigenous knowledge for pro-active adaptation of local people in changing climate.

Keywords: Climate change, indigenous knowledge, flood, adaptation

DEVELOPMENT OF LINER SYSTEM IN LANDFILL SITE USING HYBRID ADSORBENT

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Abstract:

Improvement of the current waste management is one of the main challenges for most municipalities. Sustainability is fundamental objective concerning waste management. Furthermore, other factors that need to consider are public health, environmental protection, resource recovery, and recycle phenomenon. As water flow from mountain area to lower area along the river, the hazardous waste material affects to the rivers area especially in lowland region. Uncontrolled landfill of industrial solid waste causes environmental pollution. Considering to the above, a new liner system at landfill site using hybrid adsorbent (HB) was demonstrated by Lab scale experiment to reduce pollution. A new mixture of hybrid adsorbent (Na-Bentonite 6%+Clay and HB 6%+clay) was used to this experiment. According to geotechnical concern, the standard compaction test and hydraulic conductivity test are used to evaluate dry density value (gd) and hydraulic conductivity value (k). It was found that liner model using HB has k-value similar to Bentonite which is conventional way as liner system in landfill site. Moreover, not only HB can remove both cations and anions whereas bentonite does not have ability to deal with anionic substrate, but also it can remove larger amount of heavy material than Bentonite. In this research, Hybrid Adsorbent (HB) clay mixtures have high potential to be a suitable clay liner for landfill sites compared with bentonite clays.

Keywords: waste management, hybrid adsorbent, liner system, landfill site

GROUNDWATER QUALITY AND HUMAN HEALTH RISK RELATED TO GROUNDWATER CONSUMPTION IN AN GIANG PROVINCE

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Abstract:

Groundwater is one of the main sources for water supply for domestic use, irrigation, aquaculture and industry. With rapidly increasing in human population groundwater becomes more important for social and economic activities. This study evaluated the quality of groundwater using data from the eight monitoring wells over the period of 2009-2016. Human health risk was assessed for the population consuming groundwater contaminating arsenic. The findings indicated that groundwater wells in An Giang province were contaminated with microorganisms. The total dissolved solids (TDS) and hardness in Phu Tan and Cho Moi wells were significant higher than permissible level (QCVN 09-MT:2015/BTNMT). In addition, groundwater wells in some small islands of An Giang were seriously contaminated with organic matters and arsenic. The mean arsenic concentration was up to 0.55 ± 1.21 mg/L. Estimation of carcinogenic risk for human population showed that the cancer risks ranged from medium (8.66×10^{-4}) to high (8.26×10^{-2}) for both children and adults. Alternative water supply sources should be offered for the population at risk. Regular health check is essential for local people in the arsenic contaminated groundwater.

Keywords: carcinogenic risk, groundwater, arsenic, health risk assessment

RESEARCH ON WATER ACCUMULATION OPERATING MODES IN FLOOD SEASON FOR HOA BINH AND SON LA CASCADE HYDROPOWER RESERVOIRS

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Abstract:

Son La and Hoa Binh reservoirs are two largest cascade reserovirs with the total storage capacity for downstream flood control of 7 billion m^3 which are stored below a normal water level. Therefore, there are severe conflicts between water users (i.e. downstream flood controls, hydropower generations, and water supplies). Inter-reservoir operation regulations in Red river basin issued on Decision no 1622/QĐ-TTg in September 17th, 2015 formed an official operation rule. However, an actual operation must be based on forecasted inflows into the reservoirs. This study has thus analyzed operation procedures for the two reservoirs and factual process of the system operation. Two water accumulation periods are proposed for the Hoa Binh and Son La cascade reservoir system in the beginning of flood seasons; they include: restricted water accumulation period and full reservoir water accumulation period. Results of 3-day-advance flood forecasting and the status of water level at Hanoi station will help to decide the mode of water accumulation for the reservoir system.

Operating the cascade reservoirs following the modes of operation proposed by this study helps increase efficiency in accumulating water to fill the reservoirs and simultaneously to ensure the safety of downstream flood alleviation (Son La reservoir water level can increase 10m compared to the pre-flood water level when Hanoi water level stays below 4.0m).

Keywords: Son La and Hoa Binh reservoir, resevoir operation, Red river

DESIGNING FLOOD HAZARD MAPPING FOR DISASTER RISK MANAGEMENT - A CASE STUDY IN VU GIA - THU BON RIVER BASIN

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Abstract:

Flooding is one of most vulnerable hazard in Vietnam, especially in central coastal provinces. In this area, flooding occurred frequently and the communities are suffered impact almost every year. This paper focus on assessing and mapping the flood hazard in Vu Gia - Thu Bon river basin, one particular basin in central coastal of Vietnam by combined GIS and hydraulic modeling. The hazard is combination of different flood frequency events with relevant sea level frequency events which was adopted for the study. Flood is simulated by hydrology and hydraulic models in order to give inundation data and maps (water depth) over the study area. These data will be used to estimate the hazard map which will help the managers have an ideal about hazard area and base on this they can make the most relevant plan for flood risk management and social and economic development. The result is the hazard map of Vu Gia - Thu Bon basin shows almost the downstream low land areas is exposed to highest hazard class H4 including Dai Loc, Dien Ban, Duy Xuyen, Hoi An of Quang Nam and Hoa Vang, Cam Le district of Da Nang. Base on that result, the Disaster management plan is suggested to reduce the impact of flood in this area.

Keywords: Disaster risk management, Flood risk management, Hazard, Vulnerability, Exposure.

FLOOD RISK ASSESSMENT UNDER THE IMPACT OF HYDROPOWER PLANT RESERVOIR OPERATION. A CASE STUDY AT DOWNSTREAM OF VUGIA THUBON RIVER SYSTEM, VIETNAM

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Abstract:

In recent years, more than 40 plants have been developed on Vu Gia Thu Bon river system. They have contributed significantly for socio economic development of locality, especially for providing a renewable electric production to reduce the green house gas emmission. Nevertheless, the hydropower dam system has caused many disasters for downstream area, first and foremost flood disaster. In order to assess the impact the system on flood aspect, a flood map is established for this region. This flood map is constructed on the combination between a system operated model (Structure Control module of MIKE 11) and hydraulic model (MIKEFLOOD). The enlargement of flood plain due to the increase of flood flow is estimated via MIKEFLOOD model, which is calibrated and validated on typical actual flood event with the statistical index reach to 0.92 as R and 0.83 as E. The variable scale of inundation area allows an operational approach for the engineering design activities dedicated to flood protection measures and resilience strategies.

Keywords: Hydrological modelling, Reservoir operation, River flooding, Vu Gia Thu Bon river system

IMPACT OF AQUATIC RESOURCES ON LIVELIHOOD OF THE PEOPLE LOWER MEKONG BASIN (A case study in Phu Loc, Khanh An communes, Tan Chau, An Phu district, An Giang Province)

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Abstract:

The results showed that people who live along the river are independent on natural resources. They are mainly the poor, low education, and landless. Their income resources are mainly based on exploitation of natural fisheries and hired work. Therefore, the reduction of fisheries resources affected their livelihoods because of reducing employment opportunities and their income. It made their life unstable. Although the aquatic resources impacted on their livelihoods, only 30,35% interviewed households in Khanh An commune, and 20,25% in Phu Loc wanted to change their job. 69,65% of interviewed households in Khanh An and 79,75% in Phu Loc commune would continue with their exploitation of natural resources fishes. They have no capital, land and other production facilities to change other jobs

Keywords: Natural aquatic resources, livelihood, Khanh An, Phu Loc, An Giang.

ADSORPTION OF CADMIUM(II) FROM AQUEOUS SOLUTION IN FIXED BED COLUMN USING COCKLE SHELL (ANADARA GRANOSA) POWDER

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Abstract:

In Vietnam, the pollution of heavy metal ion is getting more attention due to the economic development. Several methods have been developed to reduce heavy metal pollution problems and adsorption technique has been widely used due to the versatility and effectiveness. Cockle is a marine bivalve mollusk, which was discharged as wastes by many marine product manufacturers and restaurants and also cause the environmental problem. Cockle can be economically used as adsorbent for the wastewater treatment. In this study, cockle shell was recycled as an adsorbent for the removal of cadmium (II) ion in a fixed bed column. The operation of the process depends on various parameters such as the inlet concentration, mass of adsorbent and volumetric flow rate. Experiments were designed by response surface methodology (RSM) and a quadratic model was used to predict the recovery efficiency after 6.5 hours. Analysis of variance was incorporated to judge the adequacy of the models. The predictions of the model were in agreement with experimental results, and the optimal condition is then estimated from the model. The maximum recovery at 6.5 hours can be achieved as high as 78.88% with the operating parameters were set as 190 mg/L of cadmium inlet concentration, 4.95 g of adsorbent powder and 7 mL/min of flow rate. The results also show that the adsorbent derived from cockle shell can be used as a low cost and effective adsorbent for heavy metal removal such as cadmium in fixed bed column.

Keywords: Fixed bed adsorption, heavy metal removal, water treatment, cockle shell.

RESEARCH ON POLLUTION OF POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) FROM WATER AND SEDIMENT OF CAUBAY RIVER, HANOI

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Abstract:

Research on the polycyclic aromatic hydrocarbons (PAHs) residue from water and sediment of CauBay river, Hanoi was carried out in October 2017. Twenty water and sediment samples were collected. The analyzed results indicated the wide occurrence of residue of PAHs in CauBay river. In water samples, Σ16PAHs concentrations ranged from 0.14 to 2.47 μg l^{-1}, while those in sediment samples ranged from 30.5 to 47.1 ng g^{-1} dw. Composition analyse of PAHs indicators indicated that burning of biomass and gasoline origin the primary source of PAHs along CauBay river. The PAHs ecological risk in CauBay river is at low level. Due to the propensity of PAHs to accumulate in various compartments of environment, further evaluation of ecotoxicological risk should be undertaken as a high priority.

Keywords: PAHs, Water, Sediment, Ecotoxicological risk.

ESTIMATION OF FLOOD PROBABILITY IN HANOI USING STANDARD MONTE CARLO SIMULATION AND SUBSET SIMULATION

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Abstract:

The estimation of flood probability plays an important role in term of river management such as dike designation or flood protection. To calculate this kind of probability, the catchment model can be used. In this study, we selected Artificial Neural Network (ANN) as function family, since they guarantee high flexibility at low complexity, computed over the period 1995-2004. The results of the model are simulated for Hanoi gauging stations measurement with satisfactory of the determination coefficient (R2) and absolute mean error (AME) seems to be good. By applying standard 'Monte Carlo Simulation' (MCS) method, the catchment model will be run many times to calculate the water level in the river. It is defined in this research that when the water level is higher than a certain threshold, there will be flood. However, such modeling approach is often limited by the high computational burden required. That prevents the employment of this model into achieving accurate estimation, which typically requires hundreds or thousands of model runs. To overcome this limitation, in this research, the recently developed Subset Simulation (SS) technique will be applied to improve the accuracy of estimation with a small number of samples. Markov Chain Monte Carlo is used in this research to efficiently generate the conditional samples. The proposed approach will be demonstrated on real-world case study: the Red River, the second largest river system in Vietnam. The efficiency of the SS method is demonstrated by comparison to the commonly adopted MCS.

Keywords: Flood probability, Red River, Subset simulation, Markov Chain Monte Carlo.

STORM WATER DRAINAGE REQUIREMENT OF BAC-NAM-HA LOWLAND AREA UNDER CLIMATE CHANGE SCENARIOS

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Abstract:

Predicting future storm water drainage demand as well as identifying high inundation risk areas and proposing appropriate drainage management solutions in the climate change context are very necessary in water resources planning for lowland areas in Vietnam. This paper presents the results of the prediction of future storm water drainage demand of Bac-Nam-Ha lowland area under climate change conditions. Projected rainfall data for the medium scenario (RCP4.5) in 2016 of Vietnam Institute of Meteorology, Hydrology and Climate Change are analyzed statistically to determine future design hyetographs. The US Storm Water Management Model (SWMM) and the lowland rice drainage model are used for rainfall-runoff simulation from the study area. The design drainage flows of the area in the 1986-2005, 2030 and 2050 periods are estimated. The results showed that for 2030 period, the design drainage flow of the area is predicted an increase of 40,8% in comparison to background period of 1986-2005; for 2050 period, it will be 61,85%.

Keywords: storm water, drainage demand, climate change, lowland area.

WATER QUALITY OF HOA BINH RESERVOIR

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Abstract:

The Da River is one of the highest hydro-power potential rivers in Vietnam. There are three hydo-power plants built on the main channel of the river: Hoa Binh, Son La and Lai Chau. Hoa Binh Reservoir has three important functions including power generation, flood control and water supply for Hanoi Capital and irrigation in the Red River Delta. Water quality of Hoa Binh Reservoir plays a key role in the development of socio-economics and the security of the North of Vietnam. Since the first channel blocked campaign on 12 January 1983, water quality of Da River and the Hoa Binh Reservoir has been changed significantly in comparision with water quality of Da River in natural condition. This paper will analyze water quality variation of Hoa Binh Reservoir basing on surveyed data, clarify the stratification of water temperature and dissolved oxygen in the reservoir, and introduce the application of vertical 2D model on simulating and estimating the vertical fluctuation of water quality of the Hoa Binh Reservoir.

Keywords: Hoa Binh Reservoir, water quality, concentration, model.

STREAMFLOW EXTENTION USING MIKE NAM MODEL FOR BANG GIANG - KY CUNG RIVER BASIN OF VIETNAM

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Abstract:

Many river basins face the widespread lack of data in both spatial-temporal scale. Bang Giang - Ky Cung (BG-KC) River Basin, among nine largest river basin in Vietnam (10 847 km^2), is one of those as this basin has only Langson hydrological station having the continuously measurement until now, while others stations were stopped records since 1970s. This study aims at reconstructing and assessing the streamflow data over the BG-KC River Basin during the period 1980s - 2000s using MIKE NAM rainfall-runoff model. Firstly, we calibrated and verified the MIKE NAM model with available data at the period of 1960-1970s. The calibration and verification were quite good as the Correlation Coefficient (CC) and Percentage Bias (PBIAS) were over 0.7 and within ±25%. Secondly, we also evaluated the streamflow using MIKE NAM model by using two more approaches. Those were flow duration curve comparison between simulated flow and observed flow at Langson station during 1980 -2009 and average streamflow during dry season comparison in the year of 2008 between simulated flows and temporarily hydrological field streamflow measurement. The results indicated that MIKE NAM model are reasonable to produce streamflow for BG-KC River Basin. Finally, we analyze the streamflow variation in decades as comparing the 1980s, 1990s, and 2000s streamflow generated by MIKE NAM model, against the observation data in 1960 - 1970s. The results show that during the period of 1980s to 2000s, most of stations, streamflow tends to be higher than 1960-1970s. Otherwise, the highest monthly streamflow in a

year was shifted from August to July after the 1970s. The outcome of this study is to provide a quality streamflow data set for water resources assessment in the BG-KC River Basin.

Keywords: streamflow extension, MIKE NAM model, Bang Giang - Ky Cung River Basin

SEDIMENT YIELD IN DA RIVER BASIN AND SEDIMENT FLOW IN HOA BINH RESERVOIR

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Abstract:

The Da River is a main tributary of the Red River in the Northwestern part of Vietnam. It has the highest hydro-power potential in Vietnam. There are three key hydo-power plants to be built on the main stem of the river: Hoa Binh, Son La and Lai Chau. These three hydo-power plants have been contributing a great deal to power generation of Vietnam and flood control for Hanoi capital and the downstream. Because of high erosion, Da is a sediment-laden river. It has been causing severe deposition in the reservoirs. This paper will introduce calculation of sediment yield, mapping of the suspended sediment module of the Da River basin, estimation of lateral sediment flow of the Hoa Binh Reservoir, some characteristics of water and sediment flow, and establishment of equation on distribution of the suspended sediment concentration along the Hoa Binh reservoir based on the surveyed data.

Keywords: Sediment, Da River, Hoa Binh Reservoir.

ANALYSIS OF RAINFALL CHARACTERISTICS IN SAGA CITY USING RAINFALL INTENSITY FORMULA

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Abstract:

Rainfall patterns in Japan are considered to change in near future that rainfall amount will be larger than conventional amount due to climate change. In order to establish various measures for flood control, it is necessary to clarify rainfall characteristics and acquire fundamental knowledge. Especially, counter measures against water hazard by inundation which active due to typical topographic condition in lowland is required in Saga city area. Rainfall in Saga City was analyzed by rainfall intensity formula to obtain tendency of changing rainfall pattern. Moreover, obtained results were compared with case of Tokyo Metropolitan area and Fukuoka City to evaluate changing phenomena of rainfall pattern in case of Saga city. It can be inferred that rainfall intensity in Saga City has a cycle and strong rainfall has not been increased. Statistical period was from 1936 to 2017 which has been divided into 4 periods of every 20 years. After that, average of annual rainfall amount and rainfall intensity formula in each period were obtained. Annual rainfall amount in period AS (1936 - 1955) was larger than period BS (1956 - 1975). Then it has been increased in period CS (1976 - 1995) and DS (1996 - 2017), As the next step, rainfall intensity formula in each period were respectively calculated by using statistical data of rainfall from above mentioned. Tendency of rainfall intensities were followed as tendency of annual rainfall amount. It was found that these phenomena are having the same tendency for the case of Fukuoka and Tokyo which is analyzed as reference. At present, government of Saga city planed inundation countermeasures against 64mm/h which is not reached the target of 72 mm/h that was indicated in period DS by rainfall intensity formula. As mentioned above, it is considered that the current counter measure is not enough against inundation. Therefore, more effective countermeasure has to be established in near future.

Keywords: rainfall characteristic, rainfall intensity formula, inundation, lowland

FLOOD SIMULATIONS FOR BAGO RIVER BASIN USING IFAS

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Abstract:

In this study, the Bago River Basin was taken as a study area. Bago River Basin is located in the lower part of Myanmar and floods often occur seriously in monsoon season. IFAS (Integrated Flood Analysis System), a distributed hydrological model developed by ICHARM, was applied to the Bago River Basin as a flood forecasting model. One of its notable functions is the capability of using both ground-gauged data and global satellite information, such as topography, land use, and rainfall in the model. This global satellite information is utilized as supplementary information to facilitate easier forecast of flood discharge in an insufficiently-gauged river basin. The global satellite rainfall data, GSMaP were used as an input data of the flood forecasting model. The simulated discharges using GSMaP (corrected) show good agreement with the observed discharge values from measuring stations both in term of flood duration and flood peak. The satellite GSMaP (original) rainfall capture neither flood duration nor did the flood peak. The calibration process was conducted for seven flood events from 2011 to 2014 and the model, Nash-Sutcliff efficiencies, ENS were calculated for discharges simulated for these flood events. Validation process was done for two flood events for 2015. As a result, the study found that the simulation with calibrated GSMaP (corrected) can reproduce river discharges with high accuracy, suggesting that satellite rainfall data with ground gauged rainfall data is applicable and effective for flood forecasting.

Keywords: Bago River Basin, IFAS, GSMaP, Nash-Sutcliffe Efficiency (ENS).

STUDY OF ON ENERGY DISSIPATION PERFORMANCE THROUGH SIDE WALL OF STILLING BASIN

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Abstract:

When designing stilling basin of high spillway and high specific capacity, lay-out of auxiliary energy dissipaters in basin (abutment, bar…) helps to improve energy dispersal condition, decrease depth and length of basin. In this study, a new solution of lowering high and allows the current overflow through side wall of basin have been carried hydraulic physical model test. The results showed that type of basin that allows the current overflow through side wall will increase effect of energy dissipation about 8 percent better than type of traditional stilling basin. It is applied for spillway of Ma 3 river hydropower project in Viet Nam.

Keywords: energy dissipation, stilling basin, side plate, physical model

METAL POLLUTION IN HANOI LAKES AND THE BIOACCUMULATION IN FISH SPECIES

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Abstract:

Metal pollution in urban lakes of Vietnam has become one of the major national environmental issues in the last decades, but there is a serious gap of knowledge about the pollution levels in water and how metals accumulate in fish species in these urban ecosystems. We addressed this by determining the concentrations in water and in fish of 3 lakes, Truc Bach, Linh Dam, Thu Le in Ha Noi, one of the most urbanized areas in Vietnam. Specifically, we determined the levels of two essential metals: copper (Cu), and zinc (Zn) and of three non-essential metals: arsenic (As), cadmium (Cd), and lead (Pb) in water samples and in gill, liver, muscle and lipid of Cyprinus carpio, Oreochromis niloticus, Lates calcarifer, Clarias fuscus and Labeo rohita from the Lakes. These lakes are suffering from extremely high loads of waste water discharge from households and restaurants. The results show that As concentration in gill positively correlated with metal concentrations in the water ($p < 0.05$). The higher As concentration in the environment, the more As would be taken up and accumulated in gill. Arsenic concentration in water collected from all the 3 lakes exceeded the safety level of current Vietnamese regulation. Arsenic tended to accumulate more in lipid than in other organs, while Cu, Pb, Zn showed a high accumulation in liver and gill. Fish muscle had the lowest metal level in all cases. Results of this study strongly recommend for a comprehensive assessment of metal pollution in urban lakes of Hanoi. The

high levels of accumulated metals, particularly As, in fish species that are used in daily consumption of local people seriously raise the concern about the human health.

Keywords: metal accumulation, polluted water, freshwater fish, urban lakes.

WATER QUALITY MODELLING FOR TOTAL MAXIMUM DAILY LOADS CALCULATION IN NHUE - DAY RIVER

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ABSTRACT:

The Vietnam Law for the Protection of Environment requires assessment of permissible pollution loading of all rivers. That is to develop total maximum daily loads (TMDLs) which identifies the pollutant that is causing the impairment and how much of that pollutant can enter the waterbody and still meet water quality standards. The present study is a modelling component in a project to develop an appropriate and feasible TMDL calculation method for water bodies in river basin of Vietnam. The TMDL process quantitatively assesses the impairment factors so that the governing body can establish water-quality based controls to reduce pollution from both point and nonpoint sources, and to restore and protect the quality of their water resources. Watershed and water quality modeling is often used during the development of TMDLs to help with one or more of these tasks. The developed model addresses stream COD and BOD using DHI MIKE 11 modelling package with rainfall-runoff, hydrodynamic, advection-dispersion and EcoLab modules to analyze the relationship between source pollutant loading contributions and in-stream response during 2015-2017. COD being an important and practical pollution index in developing countries which had not been so far simulated in Vietnam with MIKE 11 EcoLab. The pollutant sources such as watershed runoff, loading from upstream waterbodies, point and nonpoint sources and in-stream alterations were evaluated for a Day river segment from Phu Ly to Gian Khau located in the Nhue - Day river watershed, a tributary to the Red River in North Vietnam. For TMDL development, pollution load scenario analysis was carried out to determine the pollutant reductions needed for the im-

paired waterbodies to meet water quality standards. The study also shows major issues in water quality modelling in the country including water quantity and quality monitoring, basic data related to pollution loads, and other uncertainties in water quality modelling to extend the modelling application to other water bodies in Vietnam.

Keywords: Water quality modelling, TMDL, Red River Delta, COD, MIKE 11

MODELING WATER FLOWS IN THE BAC HUNG HAI IRRIGATION SYSTEM

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Abstract:

The Bac Hung Hai Irrigation system is known as the largest irrigation systems in the Northern region of Vietnam, with high stresses and significant difficulties in terms of both water irrigation and drainage. The latter is due to the combined effects of several factors existing in the system such as the complicated rivers and channels network, a large numbers of hydraulic structures and human-induced changes. In order to operate efficiently the structures, besides field measurements, a numerical model that allows for simulating flow processes within the whole system is still crucial and challenge. In this context, a hydraulic model namely MIKE 11 is implemented and applied for simulating the flow processes in the Bac Hung Hai Irrigation system. Firstly, a sensitivity analysis and calibration of modeling parameter is performed using the data in year 2015. Then, the model is validated using the data in the year 2016. The results show that the model well reproduces the observed water depth at ten measurement locations for both calibration and validation steps.

The root mean square error (RMSE) and mean absolute error (MAE) of water depth varies between 0.03 and 0.37 m. These errors are only of about 10% of observed magnitude of water depth at the locations. Indeed, the correlation coefficient between observed and computed water depth is greater than 0.8 at most stations. Finally, a discussion of discrepancy between simulated and observed water depth is also presented.

Keywords: Bac Hung Hai Irrigation system, regulation and operation rules, water irrigation and drainage, numerical model.

ASSESSING THE IMPACTS OF LAND USE CHANGE ON WATER FLOW IN SESAN RIVER BASIN

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Abstract:

Forests play integral parts in water regulation, soil protection against soil erosion and nutrient retention. In recent years, river basins in the Central Highlands in general and Sesan River Basin in particular have been facing abnormal changes in surface flow. Flood in flood seasons increased both in peak and total volume, while there was shortage of water for daily activities and production in dry season. And one of the reasons of this phenomenon is because of indiscriminate forest exploitation and changes in vegetation cover. SWAT model (Soil and Water Assessment Tool) and GIS (Geographic Information System) were used in this study to assess the impacts of land use change on water flow in Sesan River basin. The results showed that with a rise of 15% forest coverage from 1983 to 1993, the peak flood discharge on Sesan River Basin in 1993 decreased around 20 m3/s compared to that of 1983, and there is significant reduction in both total flood season volume and total dry season volume in the 1983 – 1993 period.

Keywords: Sesan River basin, SWAT, water flow.

THE LIVELIHOOD VULNERABILITY TO FLOODS IN FULL-DYKE SYSTEM IN CHO MOI DISTRICT, AN GIANG PROVINCE

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Abstract:

The measure of livelihood vulnerability to flood in the Cho Moi District, An Giang Province was conducted based on the Livelihood Vulnerability Index (LVI) developed by Hahn (2009) combined into the sustainable livelihoods framework developed by DFID (2000). Interviews with local government and residents were done to collect data on flood trends and five livelihood capitals including human, physical, social, natural and financial ones. Overall, the obtained results showed an increasing likelihood of small floods in recent decade and a low livelihood vulnerability score of 0.287. The results from accessing the five livelihood capitals demonstrated that financial capital was the least vulnerable indicator to floods, while natural capital was the most vulnerable one, followed by social capital, human capital, physical capital. The IPCC vulnerability index showed that vulnerability to climate change in the research area was moderate with LVI-IPCC score of 0.062. Moreover, it also suggested that the poor was more vulnerable to floods than the rich (LVI score of 0.368 and 0.259, respectively) especially in physical, human and social capitals with high variability.

Keywords: vulnerability, livelihoods, floods, climate change

DESIGN FLOOD ESTIMATION IN THE CONTEXT OF CLIMATE CHANGE - A CASE STUDY IN THE SOUTH CENTRAL AND HIGHLAND PROVINCE

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Abstract:

Design flood estimation is one of the important tasks of hydrological science. Due to the climate change and safety criteria for flood prevention, it is necessary to re-estimate of design flood for reservoirs. There have been many studies and reports on the impacts of climate change on heavy rainfall in Vietnam. However, there is some uncertainty between the results due to differences in input models, scenarios and detailization methods. The paper focuses on assessing and analyzing the change of design flood based on the changing of maximum rainfall in the South Central and Central Highlands under the average climate change scenarios (RCP4.5) and high climate change scenarios (RCP8.5) using different global climate models (GCMs). The variation among the models (in percentile 25 to 75 percent) varied from 10 percent to 50 percent, indicating the uncertainty in rain simulation of each GCM. The majority of models also show an uptrend but vary greatly from over 0% to 70-80%. A few models simulate a downward trend, albeit negligible compared to the baseline scenario, such as the CNRM-CM5, CSIRO-MK3.6, FGOALS-g2. As a result, flood simulation from the rainfall will be different according to the different climate models. A «potential change» in peak discharge map is generated for Highland and South Central region taking into account the differences of scenarios, climate models. Based on that, the design floods in the basins in each region will be adjusted accordingly to ensure the safety and economics of the works.

Keywords: Design flood, Climate change, Global climate model, bias correction, South Central, Highland

ASSESSMENT OF THE IMPACT OF FERTILIZER APPLICATION ON NITROGEN LOAD USING SWAT MODEL: A CASE STUDY IN BAC DUONG IRRIGATION SYSTEM, VIET NAM

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Abstract:

An excessive use of nitrogen in agricultural cultivation causes to excessive nitrate concentration in the drainage system. The agricultural service area of the Bac Duong irrigation system has suffered nitrate pollution since the 2000s. This paper aims to assess impact of change in fertilizer application on variation in both NH4 and NO3 concentration in drainage canals during the period of 2000 - 2013. The results indicate that a decrease by 50% in manure together with a decrease in nitrogen fertilization by 33% in spring season and 46% in wet season induced a decrease in NO3 by 38% and in NH4 by 46%. In addition, variation in both Q1 (Quartile 1) and Q2 (Median) was greater than variation in Q3 (Quartile 3). IQR (Interquartile range) of NO3 ranged from 0.03 mg/l to 2.2 mg/l and IQR of NH4 was in the range of 0.37 - 7 mg/l.

Keywords: SWAT; fertilizer application; long-term simulation; nitrate pollution

CLIMATE CHANGE IMPACT ASSESSMENT ON STREAM FLOW OF LAIGIANG RIVER, VIETNAM

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Abstract:

Climate change due to the increase of greenhouse gas emissions is considered to be one of the major challenges to the human beings in 21st century. The consequences of these phenomena will influence on many aspects of human society. Particularly at river deltas, coastal regions the impacts of climate change to socio-economic development are more serious. So there is a need to have a robust and accurate estimation of natural factors variation due to climate change to provide a strong basics for mitigating its impacts and adapting with these challenges. Lai Giang (F=1.466km^2) is second largest river of Binh Dinh Provine. This river plays an important role in Binh Dinh province's socio economy development. However, this river also brings to north of Binh Dinh many potential risks, especially in the context of climate change. With the aim of evaluating the consequences of climate change in Lai Giang catchment, the study utilizes a deterministic hydrological model (MIKE SHE model) to simulate the stream flow variation. The model is constructed with specific catchment characteristics. It is calibrated and validated over a period of 18 years from 1995 to 2009 with the impressive coefficients (NASH reachs to 0.82, R reachs to 0.91). The data about climate change is supplied by Vietnamese Ministry of Natural Ressources and Environments.

Keywords: Hydrological modelling, MIKE SHE, Climate change, Lai Giang catchment.

APPLICATION OF SWAT AND IQQM MODELS FOR WATER DEMAND ASSESSMENT IN THE XEDONE BASIN OF LAO

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Abstract:

This paper presents the results formulated the water demand in the Champasak province as the lower of the Xedone river by using The Soil and Water Assessment Tool (SWAT) model and Integrated Quantity and Quality Model (IQQM). The main objective of this study is integrating the science of meteorology, hydrology, and hydraulics by using the appropriate and effective method in water demand assessment on population and irrigation. The SWAT model was used for the hydrology study, while IQQM was used for water demand on population and irrigation study. In this study, the models were applied to assess water availability and in the future of the Xedone river basin, Champasack provinces in southern of Lao PDR.

Keywords: Water resources, SWAT model, IQQM, water demand, irrigation study

LINKING VIETNAM FOREST TENURE POLICY ASSESSMENT TO SUSTAINABLE FOREST MANAGEMENT, LIVELIHOODS, ANDCLIMATE CHANGE MITIGATION

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Abstract:

Forest tenure policy plays a vital role in shaping the forestry sector and significantly facilitates forest transition and rural transformation in Vietnam. The objective of this article is to assess current forest tenure policies and its gaps regarding sustainable forest management, responses to climate change, emergencies, and the livelihoods of forest dependents using the assessment framework Voluntary Guidelines on the Responsible Governance of Tenure of Land, Forests and Fisheries. The study team critically reviewed a total of 79 legal documents related to forest land tenure that cover: 1 constitution, 8 laws, 1 resolution, 20 decrees, 30 circulars, 18 decisions, and 1 directive. The results were three themes (a-sustainable forest management; b- responses to climate change and emergencies, and c- responses to livelihoods of forest dependents) corresponding to nine sub-themes/criteria that reveal that the documents ranked from 1 ("slightly addressed") to 2.5 (between "moderately

addressed" and "mostly addressed") for nine facets of forest tenure rights. The finding illustrates the constant improvement necessary for forest tenure policy to further achieve outcomes on climate change mitigation, rural livelihood, and sustainable forest management.

Keywords: Forest tenure, sustainable forest management, climate change, livelihood

APPLICATION OF ISIS MODEL FOR FLOOD CONTROL IN THE XEDONE BASIN OF LAO COUNTRY

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Abstract:

Agriculture is the largest sector of employment mainly is irrigation, also over the year's rapid growth in population; they cause the increasing demand for water and necessary for defining water available and Flood is natural disasters. The main objective of this study is finding an effective method in flood control for Xedone River, Champasak and Saravanh provinces in southern of Lao PDR. This case study used an ISIS model to simulate the natural Xedone river flow in some years under the assumption that the Xedone floodplain is fully protected by levees on both sides and floodgates along the lower Xedone starting from Khongxedone to the river mouth and in the future.

Keywords: Flood control, ISIS model, river flow, river mouth, Xedone river.

NUMERICAL STUDY OF THE CHANGE OF FLOW IN VAM NAO RIVER DUE TO LEVEE SYSTEMS IN MEKONG DELTA

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Abstract:

In recent 20 years, a system of levees in Mekong Delta was constructed intensively. These levees altered the hydraulic regime overall delta, including flow in Vam Nao river. A numerical 1D2D3D integrated model was established in which flow on the flooded area was modeled by 2D model and flow in Vam Nao river was modeled by 3D one. Using the model, the change of flow structure was investigated.

Keywords: 1D2D3D integrated model, Mekong delta, Levee systemss, Vam Nao river, Flow structure.

EVALUATION OF TRMM MULTI-SATELLITE PRECIPITATION ANALYSIS (TMPA) PRODUCT (3B42) OVER INDONESIA (1998-2017)

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Abstract:

Precipitation is probably the most highly intricate climate factor, due to its uncertainty in space and time. It plays a significant role in a hydrologic cycle and processes. Rain gauges supply us with a point-based surface precipitation data; while satellite data contributes to the global and regional precipitation estimates. Therefore, it is inevitable to have a comparative evaluation of a gauge-based and satellite-based data in hydrological and water resources studies. This study evaluates the applicability and quality of TRMM (Tropical Rainfall Measuring Mission) Multi-satellite Precipitation Analysis (TMPA) product (3B42 daily data) to rain gauges data over Indonesia to better comprehend the use of satellite data of ungauged basin. Rain gauges and TRMM 3B42 data were available from 1998 to 2017.

In general, TRMM 3B42 performed adequately well with slight overestimates of precipitation on monthly average scale over Indonesia. The best estimation was achieved in February with only 0.1 mm/month difference. On monthly basis, all statistical indices vary throughout the year, exhibiting the highest R-squared value in August and the lowest bias in May. Statistical analysis shows that, when averaged over all locations, TRMM tends to estimate, a false 'base'

of 40 to 150 mm/month higher than measured (the intercepts), and then, following that under measured gauge needs to increase up to 50% (the slopes). High precipitation values tend to have positive correlation with high RMSE over Indonesia. The Inverse Distance Weighting (IDW) interpolation technique displays areas with the highest precipitation in North Sumatra, West Borneo, and Papua.

Keywords: TRMM, Precipitation, Ungauged Basin, Indonesia

AN ASSESSMENT OF AGRICULTURAL PRODUCTIVITY IN THE UP STREAM OF THE VIETNAMESE MEKONG DELTA UNDER WATER RESOURCES CHANGE

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Abstract:

The aim of this research was to compare between the agricultural activities in full-dykes and semi-dykes systems in the Vietnamese Mekong Delta (VMD) with the case study of An Giang province. Data were collected by direct interviews with stakeholders (households and local government) and participatory rural appraisal approach (PRA) with 06 groups of local farmers with different socio-economic background (rich, average vs. poor and large-holders vs. small- holders) who had experiences in agricultural production. Then, these data were analyzed by a combination of qualitative and quantitative statistics. Research results suggested that productivity of agricultural activities from intensive cultivation in the full-dykes system decreased over time, lower than that of the farming systems in the semi-dykes system. The driving factors of the decrease in productivity could be accounted for the lack of flood flush in fields for many years since the full-dykes construction and non-compliance among farmers with the and quota;3 years with 8 crops and quota; policy, leading to the lack of natural nutrient from sediment. Consequently, the production cost had risen because of soil degradation, pests and harmful animals (e.g. rats and snails). The research provided an overview on agriculture productivity under the impacts of dyke systems and changes in water resources, therefore the obtained results can support the decision-making process in the construction and management of the proposed full-dykes system and agriculture development in An Giang in particular and upstream regions in the VMD in general.

Keywords: Agriculture productivity, full-dykes system, semi-dykes system, upstream of the Vietnamese Mekong Delta.

EVALUATION THE IMPACT OF CLIMATE CHANGES ON STREAM DISCHAGE AND PREDICTING DROUGHT, FLOOD IN CAU RIVER WATERSHED, NORTHERN VIETNAM

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Abstract:

The purpose of this paper is to implement "Soil and Water Assessment Tool model and GIS to evaluate the impact of climate changes on stream discharge in Cau river watershed in Northern Viet Nam as well as predicting the drought and flood at downstream. The watershed were cover by 56% forestry land, 30% agricultural land, and remain for others. Stream discharge observed data 2002 - 2017 were used for calibration (2002 - 2009) and validation (2010 - 2017). Three climate change scenarios B1, B2, and A2; representing low, medium, and high levels of greenhouse gas emission, respectively, were considered in this study. The result shown that two coefficients (NSE and PBIAS) to evaluate model performance were 0.76 and 6.54% for calibration period and 0.87 and 4.74%, respectively. The highest changes in stream discharge (up to 14.35%) can be expected in wet season in 2050s according to the high emission scenario (A2), while for the low emission scenario the corresponding changes equal to 8.8%. The predicting results also indicated that drought and flood phenomena will be more surious in the near future within watershed during wet and drought season.

Keywords: stream discharge, watershed, SWAT model, climate change scenario.

WATER SECURITY INDICES FOR DELTA AND COASTAL AREA OF MA RIVER BASIN

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Abstract:

The issue of water security is crucial and very important problem for many river basins and regions in the world, especially in the context of rapid development and climate change. In the urban regions, river deltas and coastal areas with rapid development, the water security is more important for water uses. Ma river in Northern Central Vietnam is international river with its delta belong to Vietnam. During the recent decades, the development of socio-economic in the delta and coastal area to make many conflicts on water uses and water security. In this paper, basing on the water resource characteristics, water demand for social-economic development and the natural factors, the study presents the results in developing a set of criteria and water security indexes for the delta and coastal areas of Ma river basin in order to propose the oriental options for water uses and environmental protection of the studied area in the year of 2015 and for the future 2030.

Keywords: Ma river basin, water security, water balance, natural disaster, water quality.

REMOVAL OF METHYLENE BLUE FROM AQUEOUS SOLUTIONS BY FIXED-BED COLUMN ADSORPTION USING SUGARCANE BAGASSE AS ADSORBENT

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Abstract:

In Vietnam, color removal from textile effluents has been the subject of great attention in the last few years, not only because of its toxicity but mainly due to its visibility. Adsorption processes which produce good quality effluents that are low in concentration of dissolved organic compounds are rapidly gaining importance as treatment processes. Sugarcane bagasse, which is the main waste from sugar industry, can be economically used as adsorbent for the wastewater treatment. Sugar bagasse has been used as a raw material for the preparation of activated carbons by heat treatment. The adsorbents are usually used in the fixed bed process because of the ease of operation. In this study, the adsorption of methylene blue by activated carbons from bagasse waste was studied in fixed bed columns. Sugarcane bagasse was thermally activated at 500°C in absence air. The obtained materials were charaterized by BET and tested for the adsorption capacity with methylene blue. The optimum adsorption conditions of column adsorption were obtained by using response surface methodology (RSM). Experiments were designed by central composite design (CCD) and a quadratic model was used to predict the concentration of the effluent after 5.5 hours. The operating parameters were varied as the inlet concentration from 20 mg/L to 60 mg/L, the bed height from 4 to 6 cm, the flow rate from 2 mL/min to 6 mL/min. Analysis of variance was incorporated to judge the adequacy of the models. The predictions of the model were in good agreement with experimental results, and the optimal condition is then estimated from the model. The results also suggested that sugarcane bassage can be used as a low cost and effective adsorbent for dye removal.

Keywords: Fixed bed adsorption, dye removal, water treatment, sugarcane bagasse..

REMOVAL OF HEAVY METAL IONS IN SLUDGE BY MAGNETIC CHITOSAN MATERIAL

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Abstract:

This document contains a detailed guideline for the camera-ready format manuscripts of the International Symposium on Lowland Technology 2018. Author(s) shall follow the layout; the font styles and sizes of this template upon acceptance of the manuscript. A concise abstract is required (maximum length 300 words). The abstract should state briefly the purpose of the research, the essential new information, the principal results and major conclusions. The abstract must be able to stand-alone and references to the manuscript should therefore be avoided. The font used in the abstract is Times-Roman, 10pt, or equivalent.

Keywords: Heavy metal treatment, sludge, magnetic chitosan nanoparticles, magnetic materials.

CURRENT STATE OF DOMESTIC WATER CONSUMPTION AND FEASIBILITY OF IMPLEMENTING RAINWATER HARVESTING SYSTEM IN THE VINH CHAU TOWN, SOC TRANG PROVINCE

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Abstract:

The research was conducted to assess current state of water use for domestic activities and the feasibility of implementing the rainwater harvesting systems for households facing difficulties in tap water and groundwater use for domestic purposes in a coastal area of the Vinh Chau Town, Soc Trang Province. Direct household interviews and literature review were done to comprehend the current state of domestic water consumption. According to the research results, Vinh Chau was one of the towns having moderate rainfall in the Vietnamese Mekong Delta (~ 1,776 mm/year) and rainwater was used popularly. However, local households did not employed harvesting techniques properly, hence the harvested rainwater did not meet the required quality for domestic use purposes. Besides, difficulties in the use of tap water, groundwater and surface water were remarkable. The quality of tap water was not suitable for household consumption because of aluminium effect and the price was high relative to household's income. Salinization of surface water and ground water quality and degradation in quantity of ground water were also causes of difficulties in water use. The research results also indicated that the use of rainwater harvested by the system demonstrated higher cost efficiency than that of

others water resources. Therefore, the installation of the rainwater harvesting system for water supply should be encouraged to provide a safe and efficient alternative water resource for domestic use, contributing to relieve domestic water related difficulties and pressure on groundwater extraction in coastal zones of the VMD.

Keywords: rainwater, rainwater harvesting system, domestic water use, Vinh Chau Town

IMPACT OF LOWER WATER LEVEL OF THE RED RIVER ON WATER IRRIGATION CAPACITY OF BAC-HUNG-HAI IRRIGATION SYSTEM

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Abstract:

The Bac Hung Hai irrigation system was built in 1958. This system is located in the centre of the Red River Delta with a natural area of 214,000ha including three provinces and a city such as Hanoi, Bac Ninh, Hung Yen and Hai Duong. The Bac Hung Hai system is surrounded by four large rivers as the Duong River in the North, the Luoc river in the South, the Thai Binh River in the East, the Red River in the West [1].

The Bac Hung Hai irrigation system is designed to take water from the Red River through Xuan Quan culvert to supply water irrigation for 111,000ha of agricultural land and draining storm water for 214,000ha of natural land to the Thai Binh River through the An Tho and Cau Xe culvert [4]. However, in the recent years, the Bac Hung Hai system often do not meet the irrigation requirements of the system when water is only taken from the Red River through Xuan Quan culvert due to low water level in the dry season and water demand of the system also increased. This paper presents the results of the study on impact of scenarios of water levels in the Red River on the capacity to meet the irrigation requirements of the system. The results showed that, if the designed frequency of 75% of the water level in Xuan Quan is 1.85m then which ensure water irrigation area about 86.0% of the agricultural land area of the system, if water level of Red river at Xuan Quan gate is 1.65m, it ensures only 69.3% of irrigation area and when the water level of Red river at Xuan Quan gate is 1.45 m, it satisfies 58.0% of the area.

Keywords: Bac Hung Hai, water requirement, irrigation area, water level.

REMOVAL OF COPPER FROM AQUEOUS WATER BY ELECTROCOAGULATION USING ALUMINIUM ELECTRODES: APPLICATION OF BOX - BEHNKEN DESIGN FOR THE OPTIMIZATION AND CHARACTERISTIC SLUDGE

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Abstract:

The research aim was that illustration of the optimal functions of removing copper in the electrocoagulation process using Box-Behnken design to evaluate effects and interactions of process factors: applied voltage, electrolyte concentration, and application time. The results showed that the optimal condition removal highest efficiency in 10 min of 96.714% Cu with asaving energy consumption of 1.03 Wh/m^3 was achieved at applied voltage 12V, doses NaCl (electrolyte) is 1.8 g/L. The characteristic of sludge produced under the conditions optimized based on the results was determined by EDX and non - hazardous in nature.

Keywords: Electrocoagulation, copper, Box-Behnken design, adsorption kinetics, energy consumption.

EXISTING EMERGENCY SPILLWAYS AND APPLICATIONS OF PROBABILITY THEORY TO RESERVOIRS

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Abstract

Within the complex of a reservoir in Vietnam recently emergency spillway has been gradually given with more attention to be constructed next to the main one in order to ensure higher flood discharge and general safety for the entire system as it has been recognized as an effective structural measure in case of excessive design floods. In recent years, many emergency spillways have been built under diversified structures either included in the orginal design or added after the construction of the headworks. The research introduced us to the existing emergency spillway here and there in Vietnam and the application of probabily level 2 theory to Da Bac reservoir in Ha Tinh. This brought about determined level of effect caused by individual works components on the safety probability of the system in case of excessive design floods thus provided scientific grounds for designing structutral measures for enhancing reservoir's probability.

Key words: excessive design flood, emergency spillway, reliability function, safety probability, failure tree.

ROOT WATER UPTAKE PATTERNS IN YOUNG AND MATURED ORANGE TREES - A CASE STUDY

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Abstract:

Effective implementation of irrigation practices requires a prior knowledge of crop-water requirements during different growth stages. Scheduling of irrigation is largely controlled by root water uptake (RWU) patterns within the rhizosphere. This research is aimed at understanding RWU patterns of young and matured orange trees using experimental and numerical frameworks. A 3-D time-lapse electrical resistivity tomography (ERT) was conducted at the two experimental plots (one at young and other at matured tree) using dipole-dipole configuration with orange tree located at the center. Pedo-physical and pedo-electrical relations were obtained in the laboratory under controlled conditions. ERT derived soil moisture data is validated with time domain reflectometer (TDR) probe observations. Soil moisture profiles of young and matured orange trees were observed to be differed marginally following irrigation. A 2-dimensional axi-symmetric form of Richards equation was then numerically solved using HYDRUS (2D/3D). Care was taken to match the node locations of ERT and HYDRUS grids for ease with calibration. Optimal parameters that constitute spatial root uptake distribution were derived for both the cases. Results of the analysis conclude that the parameters defining the position and shape of root distribution are the same between the two cases. Matured tree has recorded higher RWU in comparison to a young tress, due to the increased depth and radial distribution of active roots.

Keywords: Root water uptake, Time-lapse ERT, Orange tree, HYDRUS.

THE PLATE REVETMENT MADE FROM POLYMER OR COMPOSITE FOR PROTECTION SLOPE OF CANAL

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Abstract:

According to tradition of technical solutions for protection slope of canal in hydraulic structure. Existing revetments made from concrete plate or ribbed pitching. The classical slope revetment is heavy of weight, which is built on soft soil caused easy unstable, subsidence or open wider joints. These technical mistakes made the structures of revetment which are not pleasing to the eyes and technical issued. In addition, the construction of concrete revetments is to take long time, difficult to check quality, especially the test of mark concrete. This research for the purpose of changing material of canal slope revetment. The proposal solution that is to using plastic plate revetment,which has four typical features, made from plastic with dimension 1.2 m in each sides, convex notch and concave notch on the surface for more hardness, orifices for drainage and a special orifice at the centre of plate for conection with screw anchor to strengthen for stability of plastic plate revetment. There is a great need to apply advanced technology to improve technical mistakes mentioned above. This paper shows a new structural of revetments which made from polime or composite and detailed fixed connection between plastic plate of revetment with screw anchor in order to keep stable of revetment for slope canal, steps of design and process of installation.

Keywords: Plate revetment, polymer, composite, plastic plate, fixed connection, screw anchor.

CUMULATIVE IMPACT OF THE INTER-RESERVOIR SYSTEM AND OTHER ACTIVITIES ON ENVIRONMENT OF BA RIVER DOWNSTREAM

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Abstract:

The Ba River Basin is the largest river basin in the South Central Region, Vietnam with river basin area of 13,417 km^2 and the average annual water volume is 9 billion m^3. There are hundreds of irrigation and hydropower projects in the basin, especially on the main streams and branches of the Ba River. In addition to its economic and social benefits, this reservoir system has significant environmental impacts, in particular the impacts of a reservoir system combined with socio-economic development. The exploitation of resources in downstream areas has caused significant cumulative impacts on the Ba river delta. This paper presents the results of the study, analysis and forecast of the cumulative environmental impacts of the inter-reservoir system in the Ba River Basin where other economic activities are taking place in the downstream reach from Ong Dinh bridge to Hung Vuong bridge, Phu Yen province.

Keywords: cumulative environmental impact, inter-reservoir system (IRS), Ba river basin

EVALUATING THE IMPACTS OF FLOOD TO AGRICULTURAL IN KON - HA THANH RIVER BASIN AREA, BINH DINH PROVINCE BASE ON RADAR AND GIS

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Abstract:

There are serious impacts of the flood on society and the natural environment, so it's important to identify the extent of floods' impacts. This will be a vital factor in monitoring and supervision, leading to necessary solutions and active response. Sentinel-1 remote sensing image data was used to identify flooded areas of Kone-Ha Thanh river, Binh Dinh province. The process of urbanization has narrowed the drainage area, causing great damage especially to Nhon Binh and Nhon Phu ward, Quy Nhon city. The ECLAC damage assessment method identified major agricultural losses due to the flood occurred on December 13rd, 2016.

Keywords: Remote sensing, GIS, Radar, Flood, Sentinel -1.

THE NUMERICAL MODEL OF THE INFLUENCE OF REAERATION TIDAL CURRENTS TO OXYGEN DISSOLVED BALANCE IN THE WATERS OF THE TIDAL MARSH (A CASE STUDY OF TIDAL FARM OF SOUTH KALIMANTAN, INDONESIA)

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Abstract:

Dissolved Oxygen (DO) is one of the most important variables in water quality analysis. Low concentrations affect and alter healthy ecological balance. Because DO is influenced by many other water quality parameters and sensitive indicators of aquatic system health. The characteristics of water quality parameters will vary depending on site specific, non-tidal swamp land is not the same as tidal swamp land. Water quality parameters in tidal swamp land characterized by site-specific parameters i.e. pyrite where pyrite oxidation events require oxygen. Due to the oxidation of this pyrite the unstable oxygen balance makes the concentration of DO <5 ppm. Water quality in tidal swamp lands can be examined by developing a numerical model of water quality. The model is based on the numerical solution of the water quality parameter equation transport. The equation is the source and sink tribe constant, and in this research begins by identifying water quality parameters in water bodies' i.e. bacterial sinks, pyrite sinks, NH_3 sinks, $N0_3$ sinks, sediment sinks, zooplankton sinks, Nano plankton sinks and current sources. Thus there is a balance of oxygen in the body of water due to the consumption of oxygen by water quality parameters and current sources with reaeration due to tidal currents the results of this study to get the relationship between the speeds of tidal currents with the amount of dissolved oxygen concentration. The velocity of the tidal stream V = 0,25 m/second yields the dissolved oxygen concentration DO = 4,49ppm and the velocity of the tide V = 0.14 m/second yields the dissolved oxygen concentration DO = 3,81ppm. The amount of tidal current velocity affects the oxygen balance in the body of water fluctuating due to the tidal current.

Keywords: water quality, oxygen dissolved, reaeration, marsh, pyrites

DYNAMIC EMULATION MODELING OF IRRIGATION WATER DEFICIT IN THE RED - THAI BINH RIVER, VIETNAM

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Abstract:

The delta of a river basin usually contains a dense and complex network of branches and canals which convey and supply water to users spatially distributed over the area. This type of network is usually represented by a physical based model such as MIKE 11 - HD of DHI. However, many problems cannot be solve with such complex and heavy model due to running time consumption and computer power limitation. That is why in numerous situations, it always require to replace a physical based model by a simpler data driven model. For example, in the problem of water management for irrigation, many policies of water allocation have to be evaluated through delta model to find down a best one. If a physical based model is used in this case study, the time consumption will be unacceptable or in many cases, the relevant computer is not available. This paper then explore the potentiality of Dynamic Emulation Modelling techniques in constructing a dynamic emulator of irrigation water deficit in the large and dense delta network of Red river basin in Vietnam . The emulator is constructed using Artificial Neuron Networks that is trained over the physical based model's outcomes to reproduce its output in suitably aggregated form of water deficit. The constructed emulator is later on embedded into the Multi Objective Design to design optimal policies of water management for this large water system, considering the most important objectives of the considered case study.

Keywords: water resources management, water deficit, MIKE 11, Dynamic Emulation Modelling, Artificial Neuron Networks.

STUDY ON FORECASTING THE IMPACTS OF CLIMATE CHANGE ON RICE YIELDS IN THE MEKONG DELTA

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Abstract:

Climate change has been affecting agricultural production in a variety of ways, particularly in the Mekong Delta region. The purpose of this paper is to study the impact of changes in temperature and rainfall on rice yields of The Mekong Delta by using multiple linear regression method. The rice yield equations were built based on time series data of climate (temperature, precipitation) and rice yields from 1995 to 2015. Based on these equations and climate change, sea level rise scenarios for Vietnam (Ministry of Natural Resources and Environment, 2016), the effect of temperature and raifall change on rice yields of The Mekong Delta to 2030 and 2050 were forecasted. The result of the forecasts has shown that: In 2030, the yield will fall about 0,135 quintals/ha (including: winter-spring crop will reduce 0,335 quintals/ha, summer-autumn crop will increase 0,2 quintals/ha) and in 2050, it will fall about 0,33 quintals/ha (of which: winter-spring crop will reduce 0,695 quintals/ha, summer-autumn crop will increase 0,365 quintals/ha) in comparison with the period 1986-2005.

Keywords: Climate change, rice yield, multiple linear regression method

DETERMINE REQUIRED SAFETY LEVELS FOR FLOOD CONTROL SYSTEM BY RELIABILITY THEORY

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Abstract:

The required safety levels for flood control system (KSNU) are considered as the combination of synthetic safety levels of construction components in system.

Base on present requirements, a system KSNU is considered as safety when each construction has safety evaluation. In addition, the safety of construction is evaluated by deterministic method. This method has some limitations and satisfy the synthetic safety levels of system.

This article uses the method of reliability theory to evaluate the safety of system KSNU in tidal zone, applying for the first stage of flood prevention project in Ho Chi Minh City.

The analysis shows that the safety levels of control system KSNU in some situations are lower than requirement even the safety of each construction in system is assured.

DEVELOPMENT OF RAINFALL INTENSITY DURATION FREQUENCY CURVES UNDER A CHANGING CLIMATE FOR BINH THUAN PROVINCE

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Abstract:

The rainfall Intensity Duration Frequency relationship is one of the most commonly used tools in water resources engineering for planning, designing or operation of water resources projects. It is of great importance to anticipate the change of rainfall Intensity-Duration-Frequency in the future for Vietnam since Vietnam has been the most seriously affected by the anomalies of climate recently. In this study, a dynamical downscaling method using four Regional Climate Models, i.e. CCAM, clWRF, PRECIS and RegCM, is adopted to develop an ensemble of high-resolution rainfall projections for Binh Thuan province under both current and future forcing conditions. Validation of the ensemble simulations is then conducted through comparing the simulated rainfall annual extremes for 1983-2014 to the observed ones. Following that, the rainfall projections for future periods are used to develop projected Intensity-Duration-Frequency curves and their plausible changes in the beginning (2016-2035), the middle (2046-2065) and the end (2080-2099) of 21st century relative to the baseline period (1986-2005). Intensity Duration Frequency curves are constructed using frequency analysis by Gumbel method, a well-founded distribution for maxima and is often used by many national

meteorological services in the world to describe rainfall extremes. The results suggest that intensities of rainfall extreme events versus various durations with different return periods are all likely to increase over time, e.g. in term of 20 years return period, rainfall intensities of the duration 30' are predicted to the change of 8.1%, 6.8% and 9.2% in the beginning, middle and end of 21st century respectively. In addition, more significant changes in the rainfall intensity are projected for extreme events with longer return periods at all given durations.

Keywords: rainfall Intensity Duration Frequency curve, Regional Climate Model, Gumbel method, climate change.

COASTAL AND RIVERINE MANAGEMENT

COASTAL PROTECTION PLAN FOR THE MEKONG DELTA (CPP)

Abstract:

The Mekong Delta is under threats. More than half of the coastline is eroding, the sediment supply decreases due to upstream and local activities, sea level is rising while land is subsiding which worsens the salt water intrusion, storm surges are getting more aggressive, the risk of flooding increases which means loss of life and property. What is needed now is an evidence-based coastal protection planning to guide the investment process to substantially upgrade the resilience of the coast and its people against climate change and natural disasters.

The Coastal Protection Plan for the Mekong Delta (CPP) is a Decision Support Tool that serves as an online Information System with comprehensive Database and Library and a set of Technical Guidelines for decision-making. The CPP follows a regional approach and crosses provincial borders. It gives specifically recommended solutions for different parts of the coast that have distinct local conditions.

The aim is to provide a baseline for decision-making to guarantee a defined protection level for the coast of the Mekong Delta as well as its designated areas against climate change impacts and natural disasters. The CPP consists of feasibility assessment of different coastal protection measures, principles and "Golden Rules" of measures, prioritization of coastal protection measures and their estimated costs as well as background data sets.

It is designated to support a diverse group of users, of which the most important include decision makers, planners, investors, donors and scientists.

The CPP is expected to offer knowledge for evidence-based decisions, give detailed guidance and recommendations on technical solutions and assist the cross provincial planning- and budgeting- processes. It recommends technical solution for different parts of the coast, for that the associated costs are also provided, which include priorities for needed investments and estimated costs for implementation.

THE USE OF LANDSAT IMAGE IN MONITORING THE SHORELINE CHANGE IN THANH DA PENINSULA FROM 1991 TO 2017

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Abstract:

Thanh Da area is a peninsula in the east of Ho Chi Minh City. The entire area of Thanh Da Peninsula is within the administrative boundary of Binh Thanh District. This place is considered a popular tourist destination of Ho Chi Minh City. In recent times, because of the complicated flow regime of Saigon River, the shoreline of Thanh Da Peninsula tends to change rapidly and sophisticatedly. This change leads to negative effects on the lives of the community living in this area. In order to reduce these effects, the managers must have an effective remedy for monitoring the change of the shoreline in Thanh Da Peninsula. This paper presents the initial results on the use of Landsat image in monitoring the change of the shoreline in this area from 1991 to 2017. The results of this research have indicated the changing tendency of the shoreline in Thanh Da Peninsula in the study period, provide the basis for the managers in this area to build appropriate strategies for sustainable management of the shoreline in this area.

Keywords: shoreline; Thanh Da Peninsula; GIS; RS; Landsat image.

ASSESSMENT AND PREDICTION OF THE RISK OF OIL SPILL FROM WATER TRAFFIC AT SON TRA MARINE PARK - THO QUANG WARD, SON TRA DISTRICT, DA NANG CITY

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Abstract:

Son Tra Marine Park in Son Tra district, Da Nang city has the area of nearly 10ha including 5 main functional areas: hotels, commercial- entertainment center, wharf for tourist boats, parking area, and a theme park. The wharf is built on an area of 1.1 ha, capable to receive boats of 650 HP engine capacity with oil tank up to 1.7 m^3 of oil. In theory if an accident happen between two boats, the amount of oil spilt would be up to 3.4 m^3 or 2.72 tons of oil. By using SA FM module of Mike 21 Model, this paper simulates the spread of oil in the area of the Marine Park, which is a host of many sensitive objects such as coral reefs, seabed weeds and the beach... to assess the possible damage and serve as a way to prepare for future accidents is the area.

The study result show that in both circumstances when there is northeast or southwest seasonal wind flow, 5 hours after a hypothetical accident, spilt oil would spread to the water surface around the theater, the performing art hall and the land area reserved for future development. However, oil would not spread outside of the area of the Marine Park, and it would not damage sensitive elements such as the coral reefs located 150m to the south and the Bai But seabed weeds which are 400m to the east due to the buffer by mean of restaurants, bars and dyke in the area.

Keywords: oil spill, risk, boat accident, Mike 21.

RELATION BETWEEN LONG-TERM VARIATION OF SUMMER-TIME WAVES AND CLIMATE CHARACTERISTICS ALONG THE SEA OF JAPAN COAST

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Abstract:

Previous researches of the authors have revealed significant increasing trends of long-term wave period along Sea of Japan coast, in which the increasing trend in July at Kanazawa coast was the most noticeable. In this analysis, significant wave period in July in duration 1971-2012 at Kanazawa port was further analyzed and compared with some related climate features. The results indicated that the occurrence probability of observed wave period in two durations (1971-1990; 1991-2012) expressed distinctly differences. The distribution of large waves in the latter duration was more than 50 percent higher than that in the former. The Pacific/North America climate index expressed a close relation with the waves. Both observed and reanalyzed wind speed expressed close patterns to the waves. Mann-Kendall tests of the mean and maximum observed wind speed indicated increasing trends at 1% significant level. Lepage tests with sample size of 15 years detected abrupt jumps at 1% significant level around 1990 - 1991 for these factors. For reanalyzed wind speed, Lepage test with sample size of 15 years indicated an abrupt jump significant at 1% level around 1991. Reanalyzed sea level pressure indicated decreasing trends. Both observed air temperature and reanalyzed sea surface temperature expressed weak increasing trends.

Keywords: Sea of Japan; long-term increasing trends; abrupt jumps; significant wave; observed, reana-lyzed; meteorological.

RESEARCH ON SOLUTION TO PREVENT SEDIMENTATION OF TAM QUAN ESTUARY, BINH DINH PROVINCE

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Abstract:

The Tam Quan fishing port, one of the three largest fishing port of the Binh Dinh province, is the centre for fishery activities in the province, and one of the key storm-sheltering places for fishing vessels in the central provinces. However, at present the access channels and the entrance to the Tam Quan fishing port is frequently accreted with the annual accretion volume is from 47,000 to 100,000 m^3. By the same time the fishing vessels have increasing displacement and power, navigation through Tam Quan entrance is difficult and unsafe. Annually there are more than 15 vessels grounded or collided with rocks, causing severe damage on both fatality and fishing equipment. Therefore, the research in finding solutions to preventing accretion for the Tam Quan fishing port is very necessary for satisfying the demands of the local people and authority.

The paper presents causes of sediment accretion, analyses sedimentation processes, and suggests solutions to prevent and mitigate the process of accretion at the Tam Quan fishing port, which helps mitigate the natural risk to the fishery community and contributes to the development in socio-economy, security, and defense the authority on islands and territorial sea of Binh Dinh province.

Keywords: Estuary sedimentation, Tam Quan fishing port, estuary hydrodynamics, Binh Dinh province.

MOVING BOUNDARY TECHNIQUE FOR TWO-DIMENSIONAL FINITE ELEMENT MODEL, WITH APPLICATION FOR SIMULATING INUNDATION PROCESSES IN THE LOWLAND AREAS OF THE MEKONG RIVER SYSTEM

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Abstract:

Lower Mekong river system, which is limited from the gauging station at Kratie (Cambodia) to the Mekong Delta (Vietnam), presents various water components such as a river and its tributaries, lakes, floodplains, flat lands, intertidal islands, delta or estuary with a wide range of temporal and spatial scales of flow and inundation processes. Due to the inherent variation of topography and constructions, different areas within the water components can undergo wetting and drying processes depending on the water elevation, requiring a special treatment of these transition wetting and drying areas when using numerical models. In this paper, the moving boundary technique, which was originally proposed by Leclerc et al. (1990), is adopted and implemented in the framework of the two-dimensional finite element model solving the depth-averaged shallow water equations. Three types of elements, i.e. wet, partly dry and dry are defined by using a certain threshold of water depth, and used to represent various wetting/drying areas in the studied region. In order to demonstrate the capability of the adopted moving boundary technique as well as the ability of the model, simulations are performed for different flow conditions in the year 2000. The results clearly showed that (i) the adopted moving boundaries technique was successfully applied to reproduce different wetting and drying areas in the lowland Mekong river system, (ii) a good agreement between simulated results and observed data was obtained at measured locations, and (iii) the model was also able to capture the wide range of temporal and spatial scales of the flow and inundation processes in the studied area.

Keywords: Moving boundaries, finite element model, Mekong Delta, Tonle Sap Lake, Inundation processes.

THREAT OF COASTAL HAZARDS TO SOCIO-ECONOMIC DEVELOPMENT IN THE CENTRAL COASTS OF VIETNAM

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Abstract:

The Vietnam's coastal zone, a home to about 20 million people, has emerged as the country's hub of coastal tourism and socio-economic development activities. In parallel with the rapid national economic growth, the coastal zone has experienced a burgeoning of various coastal facilities and development over the past two decades. As a result, the central coastline possesses many charming beaches which are internationally recognized as one of the attractive coastal destinations. However, the central coastline of Vietnam has suffered severe impacts due to human-induced interventions and global climate change effects that resulted in increasing unpredictable coastal hazards such as saline intrusion, floods, and beach erosion. More than 260 erosion sites recorded, and a remarkable reduction of sand deposition were observed in coastal provinces from Thanh Hoa to Binh Thuan. Though most of erosion sites is resulted from the morphological response to localized extreme weather conditions, tourist industry together with man-made structural facilities may play significant factors of erosion consequences. The purpose of this study is to identify natural forces and human interventions which pose major causes for erosion and to discuss possible measures for minimizing the threats of coastal hazards to socio-economic activities in the central coastal cities of Da Nang, Hoi An, Nha Trang and Phan Thiet.

Keywords: coastal zone, erosion, socio-economic activities, tourist industry.

SALT INTRUSION MODELLING AND PREDICTION USING MIKE - SWAT - GIS TOOLS: CASE OF THE VE RIVER ESTUARY, QUANG NGAI

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Abstract:

Saline intrusion is becoming more serious at Ve River Estuary; however, currently, researches on this area are limited. In this study, we use MIKE NAM model to calculate the surface water resource characteristics as input data for a two-dimensional surface flow model system (MIKE 21) with a diffused transmission model used to assess the salt intrusion at Ve River Estuary in Quang Ngai province, to forecast the salt intrusion due to climate change and sea level rise. The model is based on the data from 2013 to 2015, which is also the baseline for comparing with the results of water balance calculations in the current and future Ve River basin. The results show that in the context of climate change, salt intrusion will be deep into Ve River.

Keywords: climate change, surface water resource, Ve river basin, saline intrusion, MIKE NAM, MIKE 21.

APPLYING GIS AND RS IN ASSESSING THE SHORELINE CHANGE IN HON DAT DISTRICT FROM 1989 TO 2017

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Abstract:

Hon Dat District is a coastal district located in the northwest of Kien Giang Province. This is the largest natural area district in 15 administrative units of Kien Giang Province. During recent years, because of complex flow regime and human activities, the shoreline of Hon Dat District tends to change rapidly and complicatedly. This change causes unfavorable effects on the lives of people living in this region. In order to minimize these effects, the managers must have an effective solution for assessing the change of the shoreline in Hon Dat District. This paper demonstrates primary results on the use of GIS and RS for assessing the shoreline change of this region from 1989 to 2017. The results of this research have revealed the changing trend of the shoreline and indicated the shoreline segments had severe erosion in Hon Dat District during the survey period (28 years). This information will be useful for managers in developing appropriate solutions to prevent shoreline erosion in this region.

Keywords: shoreline; Hon Dat District; GIS; RS; Landsat image.

ESTIMATING COASTAL WATER QUALITY IN DANANG BAY, VIETNAM: MODEL DEVELOPMENT AND PARAMETER ASSESSMENT

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Abstract:

The development of coastal areas recently has paved the way for the new opportunities in Vietnam, when more investments and projects have been approved, promising a bright future of prosperous development. However, apart from those benefits, rapid development causes negative impacts on surrounding environment. Urbanization has unintentionally put a great pressure on infrastructure and ecosystems, coupled with pollution rooted from upstream streams, resulting in the expansion of polluted areas which causes great damage on living standards of those households living in coastal areas. With the purpose of evaluating imbalanced impacts of wastewater treatment plants on causing pollution in Danang Bay, this study applies the MIKE 21 model for evaluating different scenarios. Outcomes from the models will help assess the level of pollution associated with the pollutant volume of waste sources. Calibration, verification for hydrodynamics (HD) and advection - diffusion (AD), Ecolab models have been implemented to ensure the reliability of this study.

Keywords: Coastal water quality, Hydrodynamics, Ecolab, Calibaration, Waste water, MIKE21.

EFFECTS OF SPUR DIKES SPATIAL LAYOUT TO RIVER BED EVOLUTION IN TIDAL RIVER

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Abstract:

Spur dikes are not only used to protect river banks from erosion but also a good approach to maintain maritime transport way. A single spur dike makes only change the local flow regime while spur dikes in series can be used as an effective measure to train the river. This study aims to study the spatial layout allocation of spur dikes in series to maintain maritime transport way in river reach which affected reversing tidal flow. A series of 10 spur dikes have been set up in a small scale numerical reversing tidal flow flume using Flow-3D software. This numerical flume can simulate the time process of tidal level as well as the river bed changes with good reliability. By testing various of angles of spur dikes, this study concentrates on analysing the effect of placing angles in the river bed under tidal flow regime. The results show that the change of various angles from 450 to 1350 would be the most effective layout of spur dikes for maximizing the scour depth in main channel to maintain martime transport.

Keywords: Spur dikes, river bed, reversing tidal flow, numerical flume , FLOW-3D.

PERFORMANCE OF EROSION RESISTANCE OF COMPACTED CEMENT MIXED CLAYEY SOIL

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Abstract:

Recently, the torrential rainfall frequently occurs, the river dike is required to enhance the function of preventing overflow and stabilizing the dike against seepage and overflow failures. It is necessary to elucidate the failure mechanism of the seepage and overflow erosion to increase the resilience of the river dike. And the countermeasure for the failures is also needed. The fine fraction floating in the river water accumulates at tidal rivers in Alluvial plains. It is necessary to dredge periodically to maintain flowability of the river. Authors develop an embankment material having high encroachment resistance producing from the high water content dredged clayey soil. This paper reports the procedure of making the embankment material using the dreged clay and erosion resistance of the material.In this research, authors develops the granular material made from the cement mixed dreged clay and conducts the model test to observe its performance erosion resistance. The compacted samples are installed in the model open cannal, and they are exposed the supercritical flow. Change of the surface shape and amount of erosion are observed. Other kind of soils, which are the decomposed granite soil and the Ariake clay, are also used to compare with results of the dreged clay. An experiment parameters are the compaction energy and water content. The compaced cement mixed clay with natural water content performs higher erosion resistance than the decomposed granite and Ariake clay. However, the compacted cement mixed clay with optimum water content is the lowest erosion resistance. And characteristics of the erosion are different from each of the soils and test condisions. The test results the erosion resistance of the cement mixed dreged clay is depend on its water content.

Keywords: Dredged clayey soil, soil improvement, compaction, erosion, dike

CALIBRATION OF TWO-DIMENSIONAL FLOODPLAIN MODELING USING SATELLITE DATA, A CASE STUDY FOR THE THACH HAN RIVER, QUANG TRI, VIET NAM

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Abstract:

Two-dimensional (2-D) floodplain modeling has been increasingly applied in Vietnam for floodplain inundation models. However, almost studies are being faced of data lack for model calibration. While, satellite data, is available and free in recent years, which can be used for calibration of at least floodplain extent and more. This article presents a case study of using satellite data for calibration of 2-D floodplain modeling for the Thach Han River in Quang Tri Province of Vietnam. The water level at Dong Ha station is used to calibrate for flood events in 2008, 2009, 2010, 2011 and 2017. The Nash–Sutcliffe coefficient of calibrated flood events are obtained from 0.5 to 0.8. The satellite images in 2017 during flood event are collected to calibrated inundated area. Almost inundated area that simulated by 2-D floodplain model are recognized also flooded in satellite images. The case study results showed that this is a feasible solution for 2-D floodplain modeling application for ungagged areas of Vietnam.

Keywords: calibration, inundation models, satellite data.

LITERATURE REVIEW ON THE MODELING OF PROCESSES RELATED TO SEADIKE TOE EROSION DURING STORMS

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Abstract:

During storms, cross-shore processes including currents and sediment transport due to the impacts of high waves and surges are the main causes of the formation of scours in front of the sea dike toes and foreshore sink. This short-term erosion that takes place in extreme hydraulic condition can cause instability of the sea dike that may no longer properly protect land areas behind, resulting in live loss and damage in infrastructure. Therefore, a number of process-based models have been developed to predict cross-shore hydrodynamics and coastal morphologic features. Those models usually emphasize on four physical processes and separate into four components: wave module, wave-induced undertow module, sediment transport and bed evolution module. The primary differences among those models are on modeling of wave breaking and undertow such as modeling of turbulent viscosity, specification of bottom boundary condition, physical terms in equations, etc… Because typical processes in surf zone and swash zone are highly complicated and the available measure data are still limited, many laboratory experiments were conducted to calibrate and validate the models. However, most experiments for studying of wave breaking and undertow have not mentioned the process of wave overtopping. Thus, modeling of wave and undertow still needs to be improved. This paper presents a review on the modeling of processes related to sea dike toe erosion during storm. As a result, a new process-based approach for modeling growth of undertow induced sea dike toe erosion is proposed suitably for Viet Nam's natural conditions.

Keywords: Storm, modeling breaking wave, undertow, cross-shore sediment transport, erosion.

WAVE REDUCTION BY A BAMBOO FENCE

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Abstract:

Climate change are leading to sea level rise and intensity of storms, which are causing serious mangrove degradation and coastal erosion along the coastal areas in the Mekong Delta. Bamboo fences have been used to support the process of mangrove restoration to protect the coast from erosion in this area. This paper presents the analysis results of wave transmitting through bamboo fence constructed in a coastal area in Bac Lieu. Waves were measured in front and behind of the bamboo fence. The results show that the wave transmission coefficient increases as the wave height, wave period or water depth increases. Moreover, as increasing the ratio of the fence free board and wave height, the transmission coefficient is decreased. The empirical formulae for the wave transmission coefficient (Kt) versus Hsi/d, Hsi/Lsi and Rc/Hsi have been proposed in this paper.

Keywords: Wave transmission, bamboo fence, coastal protection.

APPLICATION NUMERICAL WAVE CHANNEL STUDY OF WAVE AND DETACHED BREAKWATER INTERACTION IN BA LANG BEACH, NHA TRANG COAST

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Abstract:

This paper presents the investigation of the wave and submerged breakwater interaction in Ba Lang beach, Nha Trang coast, Vietnam, using the numerical wave channel. The research results showed that the numerical wave channel had good capability in conducting numerical experiments with high nonlinearity of waves including the wave breaking and wave overtopping processes. In addition, the results also indicated that the structure of wave currents under wave motion was very complicated, especially the area around the breakwater. The effect of wave reduction depends on the free board height and a breakwater with free board height equal zero could be reduced 56.35% of wave height.

Keywords: Ba Lang beach, Nha Trang coast, numerical wave channel, submerged breakwater, free board

INFLUENCES OF MANMADE STRUCTURES ON STORM SURGE FLOODING

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Abstract:

The coastal lowland areas are usually protected by sea-dike and estuarine dike systems. In these areas, roads and railways are also elevated significantly above the ground. These manmade structures have significant influences on coastal flooding as they prevent and slow down not only the flooding process but also the recession of the floods. However, modeling of these kinds of manmade structures in a large area is challenging and it requires different approaches for each situation of modeling practice. There are three common techniques to take into account the systems of roads, railroads and dikes as follows: 1) Using very fine grid resolutions and rising the topography to simulate embankments. This will increase the size of the problem and the time required for simulations. 2) Using different bottom roughness for manmade structures. However, the right value of bottom roughness is difficult to estimate as the data supporting the selection of the roughness are very rare. 3) Simulating the embankments as broad-crested weirs. This could be the best approach to include the manmade structures, but it requires the ability of modeling software to support the approach.

This paper will present an analysis of manmade structures including sea-dike, roads and railways on the flooding and inundation in a coastal lowland area due to a severe storm surge. The influences of the structures on coastal flooding are investigated on several aspects of flooding duration of flooding, extent of flooding and the maximum inundation depth.

Keywords: coastal flooding, storm surge modeling, lowland inundation.

SPATIO-TEMPORAL TRENDS OF EXTREME RAINFALL AT A SUB-BASIN SCALE OF THIVAI RIVER IN SOUTHERN VIETNAM

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Abstract:

Rainfall is a key input parameter for water resources management and hydrologic models. A variety of rainfall characteristics such as intensity, duration, dry and wet days has significantly impact on agriculture and natural resources. Thus, an analysis of changes in rainfall characteristics is increasingly meaningful in the hydrological projects, especially in flood events at a small scale due to the unpredictable changes of rainfall over the tropical regions in general and over coastal region in southern Vietnam in particular. To date, plus, there are very few studies of rainfall trends for a small basin in Vietnam for a long-term, particularly for a scale of sub-basin. The main purpose of this paper is to provide a deeper understanding of changes and variability in rainfall at a small scale. The ten indices of rainfall are estimated on the basic of daily rainfall data from 13 meteorological stations. The effect of autocorrelation parameter is also considered when the nonparametric test of Mann-Kendall is applied for the time series data to detect the trends in rainfall data. The Theil and Sens's slope estimator test is selected to find the magnitude of change. In order to explore spatial patterns of the trends at sub-basin scale, ArcGIS software is applied. The results indicate that a significant trend (positive or negative) is detected at four stations for maximum consecutive dry days and two stations for maximum consecutive wet days. The mixed trends of increasing and decreasing rainfall characteristics have been documented. The decreasing trend in rainfall amount is the most obvious in June, followed by August.

Keywords: Rainfall, Mann-Kendall, autocorrelation, wet day.

LONGSHORE SEDIMENT TRANSPORT VARIATIONS ON A MESOTIDAL SANDY BEACH

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Abstract:

Longshore sediment transport estimation using littoral environmental observation (LEO) methods are often based on one data per field visit measurement from a representative location. In order to understand the variations in longshore sediment transport rate (LSTR) during daylight time, LEO measurements were carried out between a rising and falling tide along two mesotidal sandy beaches of north Goa on the central west coast of India. Variations in LSTR between one-time measurements versus LSTR estimated over different periods of the day are studied. The estimation of LSTR with a single set of data and multiple data can be further yields to an error between 2% and 310%.

Keywords: Long shore sediment transport rate, wave, current, sediment grain size, beach-slope.

A NEW APPROACH FOR GENERATING CONTOUR LINES OF BIVARIATE EXCEEDANCE PROBABILITY: APPLICATION TO HYDROLOGY

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Abstract:

Equidensity contour lines are usually used to describe bivariate data, but they have never been a good way to interpret exceedance probabilities. Our approach, using line mesh distribution, for producing contours for bivariate joint exceedance probabilities is to use a data-determined mesh of lines, with a univariate probability distribution defined along each line. In this way, the mathematical complexities of multivariate distributions are reduced to the simpler situation of a finite mixture of univariate distributions. With the bivariate data, we divide the plane into grid, and then calculate the exceedance probability on each node of the grid by the new approach and by copula. The bivariate exceedance contours are then obtained by collecting the similar values of probability. In presenting this research, we first use copulas to obtain exceedance probability contours and then make some comparison with line mesh distribution.

This approach could be an alternative to copulas and the other multivariate applications presently used in multi-variable extreme event analysis of environmental variables – with focus mostly on hydrological applications. This approach is largely nonparametric and allows estimates to be made of joint exceedance probabilities beyond the largest data points. It means that it does not require a distribution assumption. Subsequently, we can avoid the bias of choosing copula families and distributions. This line mesh method is also a good tool to deal with some more complex issues, such as building contours of bivariate exceedance probability at a river confluence, which hardly can be done by other methods.

Keywords: multivariate, copula, line mesh, joint exceedance probability, nonparametric, contour

APPLICATION OF REMOTE SENSING AND GIS TO STUDY THE EVOLUTION OF RED RIVER DELTA COASTLINES FROM DO SON TO NGHIA HUNG DURING PERIOD 2005 - 2015

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Abstract:

Remote sensing and GIS technology was applied to assess the evolution of coastlines. 3 sets of satellite images in February of 2005, 2010 and 2015 along the coastlines of Red river delta from Do Son (Hai Phong city) to Nghia Hung (Nam Dinh) were used for analysis.

The analysis on the evolution of coastlines is implemented for each districts where separated by river mouth. With this idea, the coastline is divided by admistrative district namely Kien Thuy, Tien Lang, Thai Thuy, Tien Hai, Giao Thuy, Hai Hau, Nghia Hung from North to South. The results show that at Kien Thuy, accretion is predominated, but accreted rate is decreased gradually. The same trend was occurred for Tien Lang coast. In Thai Thuy district, accretion is continuosly incressed from 2005 to 2015 with rate of 12m/year to 22m/year. Situation at Tien Hai is accretive in period 2005 - 2010, but eroded rate in 2010 - 2015 is of 4m/year. Situation at Giao Thuy is mostly opposite to Tien Hai with erosion during 2005 - 2010 with rate of 12m/year and accretion of rate of 7m/year in 2010 - 2015. In Hai Hau, coastline is eroded seriously during 2005 - 2010 with rate of 11m/year and became accretion in next period. Nghia Hung coast was accreted continuosly from 2005 to 2015 with high rate of more than 30m/year.

Keywords: Remote sensing and GIS technology, erosion and accretion, coastlines, rate of accretion/erosion

AN ANALYSIS OF HISTORICAL BEACH EROSION ALONG THE CENTRAL COAST OF VIETNAM

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Abstract:

More than one fifth of the coastlineis being eroded in the central part of Vietnam. The phenomenon causes many negative impacts on the social-economic development in 14 provinces from Thanh Hoa to Binh Thuan.Properly understanding and predicting the variation in shoreline change have become more and more essential to any community in the coastal zones, especially under impact of sea level rise and climate change. Therefore, we attempt to update and enrich the data on the coastal erosion. To this end,we analyse satellite images to quantitatively investigate the erosion phenomenon. Furthermore, we propose to assess how dangerous and serious an eroded section is by taking into account the length, speed, duration of the phenomenon and the number of household to be affected.Hopefully, the new assessment tool may help to improve the long-term strategy to protect an increasing number ofcoastal cities and towns locating from North to South.

Keywords: beach; classification; coast; erosion; satellite, Vietnam.

STUDY EFFECTS OF DECK THICKNESS OF JETTY ON THE INTERNAL FORCE DISTRIBUTION OF PILES UNDER WAVE FORCE

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Abstract:

In this paper, the author has studied the effects of deck thickness of the jetty on the internal force distribution of piles under wave force, SAP 2000 software one of the modern structural calculation with high-precision results, easy to apply to be used to analyze the internal force distribution of piles in the jetty foundation. The author also presents the calculations of the internal force distribution for the specified jetty in the sea, that belong to Kien Giang Province.

Keywords: jetty, pile foundation, internal force distribution on piles, wave force, numerical model.

HOUSEHOLDS' AWARENESS ON UNTREATED WASTEWATER CONSEQUENCES IN TRADITIONAL AGRO-FOOD PROCESSING VILLAGES NHUE-DAY RIVER BASIN, VIETNAM

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Abstract:

A huge volume of untreated wastewater from agro-food processing production in Nhue-Day river basin discharged directly to the near rivers, lakes, ponds or canals of the households. The negative effects of untreated wastewater on health risks, environment degradation, limited recreation activities and agricultural production reduction are undeniable whether wastewater is reused or not. Despite some previous studies evaluated the health-risk awareness about the untreated wastewater and no research has been conducted on the perception of agro-food households on the consequences of untreated wastewater to environment, agricultural production and recreation activities. This study contributes to knowledge by determining the factors that affecting the households' awareness on the adverse effects of untreated wastewater in Nhue-Day river basin. Cross-section data from survey with 276 selected Agro-food processing households and ordered Logit model were used to identify the determinants and evaluate the households' awareness of untreated wastewater risks. The results showed that number of times that members in the respondents' family got sick within 6 months ago, relation of respondent to decision maker, age of respondent, education level of respondents, and logarithm average monthly income of household had significantly impact (p-value <0.05) to the untreated wastewater consequences awareness of households. In addition, most of these variables have positive relationship with the households' awareness about the agricultural

production reduction, limited recreation activities, and health risk. It should be organized the educational training courses, workshops or programs for the agro-food households on effects of untreated wastewater and its reused into improve their perception.

Keywords: untreated wastewater; agro-food processing households; ordered Logit model, household awareness.

SEDIMENT TRANSPORT ON NEGARA RIVER TRIBUTARIES AND ANDI TAJANG BRIDGE SCOURING ANALYSIS

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Abstract:

Erosion and Sediment process in the river may bring the river channel into continues degradation and agradation (dynamic stability) which can cause the changing in river morphology. Meanwhile, bridge scours happens as a consequence between streamflow contraction and bridge piers/abutments existence. The Contraction will make the turbulence streamflow regime which can dig a hole under the piers. The settlement and erosion on those piers could be dangerous for the whole bridge structure. This research is to analyze scouring impact on the Andi Tajang bridge, which is located on the Negara River in South Kalimantan Province, Indonesia.

Data collections to calculate the sediment transport and scouring process are discharge series, soil samples, and River Geometry. Those datas were inputed into HEC-RAS 5.1.0 software created by USACE using four Formulas to calculate sedimen transport: Laursen, Engelund-Hansen, Meyer Peter Muller, and Toffaleti.. Analysis is held by using three months simulation timestep. Meanwhile the technical specifications of Andi Tajang Bridge were modeled into HEC-RAS 5.1.0 geometry model, then calculated the scour by considering the scour of contraction and piers. Discharge being used to calculate bridge scour is the designated discharge with return period of 50, 100, 500, and 1000 years.

The study Results are maximum average of sediment capacity of Negara River which is 374,21 tons/day, sediment discharge and concentration which are 35,35 tons/day and 6,67 mg/l. Maximum scour occurred on Andi Tajang Bridge simulated by the discharge design capacity 267,41 m^3/s (in return period of 1000 years) is 2,98 m depth. Based on the result, the sediment occurred in Negara River is quiet massive in several parts means the river healths must be taken more seriously. Also, to prevent the damage of the whole bridge structure caused by scouring, Andi Tajang Bridge's lower structures should be protected well.

Keywords: Sediment, Scour, Bridge, Negara River, Andi Tajang Bridge, HEC-RAS 5.1.0.

TWO-DIMENSIONAL NUMERICAL ANALYSIS ON FLOW CHARACTERISTICS OVER FIXED DUNES

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Abstract:

The turbulence is one of the most important characteristics of the water flow that transports the sediment. The moving of particles leads to the occurring of scour, which threaten hydraulic structures such as fixed weirs and bed protection. This paper deals with a turbulent flow developed in dunes channels by applying different two-dimensional Reynolds-averaged Navier-Stokes equations (RANS) turbulence in OpenFOAM toolbox. The turbulence models, and SST, taking into account the bed roughness, predicted the bed shear stress as well as the velocity and turbulence property over the dunes. The modelling details of the flow velocity profiles in stream-wise and water-depth directions and the turbulent kinetic energy was compared to the experimental data from the previous research. Our simulation data from SST turbulence model were in good agreement with previous research in the two-dimensional fixed dunes. The results of and also were reasonably predicted where near the bottom and free stream region because of setting proper wall function. Thus, this present study results suggest that turbulent scheme is suitable to use for water flow moving through the fixed dune, however additional analysis needs to be conducted with the variation of boundary conditions.

Keywords: fixed dunes, numerical modeling, turbulence models, flow velocity, turbulent kinetic energy, boundary conditions

ENVIRONMENTAL SENSITIVITY MAPPING FOR CON DAO ISLANDS

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Abstract:

This paper presents a newly comparative approach in environmental planning and assessment in Con Dao district, called environmentally sensitive zoning. The generation of environmentally sensitive area maps by using Multi-Criteria Analysis (MCA) method integrated GIS would be greatly helpful in management and sustainable development of the island district. The result of the research has shown that Areas of high environmental sensitivity include the centre of Con Dao Town, the area near Con Dao airport; Areas of medium sensitivity are close to the beaches such as Lo Voi, Dat Doc, Ong Dung, Dam Trau, and most of them are the forest reserve on the islands; The rest areas have low environmental sensitivity.

Keywords: Con Dao dictrict, environmentally sensitive, Multi-Criteria Analysis (MCA), GIS.

APPLICATION SENTINEL - 2 TO RESEARCH MARINE PLANTS BEDS IN AN CHAN COMMUNE, TUY AN DISTRICT, PHU YEN PROVINCE

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Abstract:

Remote sensing technology has been widely used in various applications related to natural resources and environment monitoring. In this paper, we evaluated the capability of using Sentinel -2 image to map the distribution marine plants in the An Chan commune , Tuy An district, Phu Yen province, Central Vietnam. Our result showed that, the Sentinal - 2 images are appropriate for evaluate the distribution of marine plant in the small area as An Chan commune. 40 hectares of marine plant has been estimated for this research area by Sentinel -2 images, among them we are defined 72 marine macro algae belong to four Phyla are Chlorophyta, Ochrophyta, Rhodophyta and Cyanophyta.

Keywords: Sentinel-2, marine plants, Phu Yen.

THE SCREW ANCHOR OF PLACED BLOCK REVETMENTS WITH DETAILED STRUCTURE AND APPLICATION TO SEADIKE SLOPE PROTECTION

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Abstract:

Protected slope of seadike by placed block revetments are popular type of revetments in Vietnam. However, instability of revetment blocks usually occurs in the form of subsidence or uplift which caused by the wave attack . Screw anchor of placed blocks is a new structural measure of protection. It is a screw anchor wich is installed in soil body of seadike, then connected with placed blocks by tendon. The bearing capacity pullout of screw anchor makes higher resistance against uplift and reducible both horizontal and vertical displacement of placed revetments. The screw anchor of placed blocks has three essentially parts: anchor head, tendon and fixed connection . The anchor head is made from plastic with twisted slot. The high tensile plastic cable is used for tendon. The fixed anchor is connected to concrete blocks at centre of placed block. The number of anchors depend on weight of concrete blocks, wave forces and the dike function. This paper shows the equation of ultimate pullout bearing capacity of screw anchor which is established. The equation is a basic of the design procedure for revetments with crew anchor, and procedure of installation of crew anchors on the seadike slope.

Keywords: Screw anchor, placed blocks, pullout, seadike

CITY PLANNING AND MANAGEMENT

EXAMINING THE LAND USE-TRANSPORTATION ACCESSIBILITY BY COMPARING BETWEENNESS CENTRALITY PARAMETERS

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Abstract:

The accessibility of transportation route is built upon the urban form elements which regulated by urban morphology of each city which essentially included to street network and buildings or urban places. The accessibility ability is relevant to availability of transit service and trip purpose which expressed through the activities in urban area. centrality analysis indices in the spatial structure of cities from such as Betweenness index, Closeness index and Straightness index are widely uses for measuring the accessibility abilities of the urban street network which can interpret the potential accessing routes within the condition of space, time and cost for understanding the structural order of complex relational networks. This study focuses on the vary interpretations of betweenness centrality analysis in land use transportation field due to the purpose of usage, scaling and type of data that subjected to utilize in order to analyze the network analysis in urban area. The study examines the concept of betweenness centrality analysis in common platform to interpret the betweenness indices then indicate the results from each index into spatial street network then considered with the actual pedestrian volume from counting methods. Comparing results of this study illustrated that the betweenness index of Urban Network Analysis (UNA) is the most effective pedestrian volume forecasting tool when considered with the relationship between building's area and distance to node of public transportation.

Keywords: Accessibility, Urban spatial structure, Land use transportation, Centrality analysis, Betweenness index

EXPLORING LAND USE IMPACT ON ITS SURROUNDING AREA OF UNIVERSITY AND TOWNS: A CASE STUDY OF CHIANG MAI UNIVERSITY, THAILAND

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Abstract:

Nowadays, the university's expansion is represented the environmental assessment for its surrounding area such as Chiang Mai University. However, there tries to manage facilities with compacted university. Among these challenges, the environmental implications are more affective when this university located near the mountain and land use changed as climate, flooding, traffic congestion, air pollution, and others. In part of spatial simulating, the result of remote sensing analysis indicated that the urbanized area is exploring into land use changed on surrounding Chiang Mai University. The urban area is grown to 23.06 per cent from 2000 to 2015. Consequently, this analysis is performed at important role of relationship between university and town, students and communities. This situation is useful for improving new paradigm of Sustainable University Town plan, which should be balanced with the quality of living and absorbed the town for enhancing the urban development process.

Keywords: University Town, Urbanization, Land Use, Highly Contemporary Sustainable Development, Campus Urbanism

RANKING OF RISKS FOR METRO TUNNEL CONSTRUCTION USING FAHP IN JINAN, CHINA

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Abstract:

Many variables exist in underground and tunnel constructions make the risks unexpected and uncertain, which could endanger the safety of a project. Risk assessment in underground constructions could help to manage and respond to associated risks. In this research, the risks in the metro tunnel construction were clarified into four types: investment risk (A1), security risk (A2), environment risk (A3) and construction period risk (A4). Based on field investigation, there are six factors (B1, B2, B3, B4, B5, B6) have dominate effects on these risks in metro tunnel construction in Jinan.. Ranking of risk is determined applying Triangular Analytical Hierarchy Process (Tri-AHP) based on the consideration of the mentioned factors. The presented study in Jinan metro line, shows that the security risk has critical effect on the success of project. The factor of spring groups in Jinan has the largest influence to induce the occurrence of risk.

Keywords: Risk assessment, metro tunnel construction, Tri-AHP, Jinan, China.

BUILDING MAMAGEMENT UNDER LIMATE CHANGE CONDITION FOR MEKONG DELTA IN VIETNAM

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Abstract:

Recently climate change affect directly to the living condition of all households in Mekong delta of Vietnam. To be aligned with such condition, people are trying to build more building with higher level to maintain all floors above the sea level. However when the tide down their building is not sufficient for such dry condition. In this research the author propose a multi purposes building management to help them solving such problem. Beside that people can approach the clever manner with bad leaving condition in Vietnam.

Keywords: Climate change, building management, tide down.

A STUDY ON LAND USE TRANSITION AFTER MODERN TIMES AROUND RIVER OF A LARGE-SCALE ONSEN TOWN IN LOWER AREA OF MOUNTAINOUS COUNTRY

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Abstract:

Japan, a mountainous and volcanic country, has numerous onsen town. Even in lower area, large-scale onsen towns have been developed. In case of such a town, the city area has often developed along riverside, and the river is expected to be used as a resource of revitalization of the area as it used to attract people in the past to attract people. Yet, the circumstances and actual conditions of the river are, however, not sufficiently clear. To clarify how the land along the river has been formed and used is significant to revitalize the area.

This paper focuses on the changes of land ownerships in case of Ureshino onsen town located in a lowland of Japan. First, we selected some organizations that largely contributed to the space formation along the river, and then conducted a hearing survey. Next, we gathered and arranged the information by using old cadastres made from Meiji era to Showa era, the real estate registry, and so on. Based on that data, we created an owner transition diagram and a map of that time checking and restoring the original land ownerships. We could reveal the actual condition while comparing land transition with the results of hearing survey.

As conclusions, we could find the followings: First, an enterprise for tourism established at the beginning of the modern era when Japan was democratized took initiative in changing the riverside land use from rice fields to public use like a park and a public bath building. Moreover, another hotel enterprise

bought lands along the river and made a large hotel zone with building complex after the second world war. These private developments within the river area were realized according to the loose situation caused by the loose restriction of low regulating the river area. Although the river low is very strictly allowed now, it is needed to find the suitable management system for better use of the riverside.

Keywords: cadastral map, cadastre, urban formation history, river side, land ownership.

A STUDY ON EVALUATION CRITERIA OF LAND PANORAMA VIEW FROM TEA PLANTATION FOR GREEN TOURISM

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Abstract:

Tea industry is one of the agricultures that are engaged especially in Asian countries. Recently, there are some attempts to use tea plantation for green tourism because of the good image caused by its greenery landscape and tea's effects on health. Thus, the aim of this study is to clarify the perception evaluation criteria of tea plantation for establishing green tourism route. The target area is Ureshino City, Saga Prefecture, Japan. This area features typical tea plantation sceneries spreading in the plain and traditional tiered fields scattered on the slope of the mountain. As the research method, we used evaluation grid method. Namely, 6 photos of the tea plantations view taken from different spots in the tea plantations were shown to 16 people from 20 to 60 years old, and the relationships between view elements and evaluation from the point of view were interviewed, then "overall evaluation structure", "outline of words used for evaluation," and "evaluation of desirability of view" were led based on the results of the interview survey. As a result of the analysis, we found that the percentage of the tea plantation in the view is the main criterion of evaluation. Specifically, it was highly rated in the evaluation grid that tea plantations were spreading across the field of vision. In another word, artifacts in the view were lower ranked, natures with wide tea plantation in the view were higher ranked. Thus, panorama view evaluation criteria of tea plantation were basically indicated.

Keywords: Tea plantation, View evaluation, Evaluation grid method

ENHANCING THE EXPERIENCE OF WORLD HERITAGE SITES VIA CYCLING FOR CHIANG MAI, THAILAND

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Abstract:

As Chiang Mai is preparing its bid to becoming a member of the UNESCO World Heritage Cities, the number of visitors to the city is projected to rise dramatically, in particular in the group of independent travelers, who are not part of tour operators, which will increasingly find themselves navigating their way through the dense urban fabric of the city. While there are numerous modes of motor transport in Chiang Mai available for independent travelers but on the whole, there is still a lack of a systematic and dedicated public transport system in place catering to this particular group of visitors. As a result, an increasing number of them are taking up alternative means of transport such as bicycles as a mode for sight-seeing in the city. The goal of this study is to develop a framework that serve as suggestion on cycling can form an important part of the city's visitor infrastructure, and role in facilitating the operation and management of world heritage sites.

Keywords: cycling route, world heritage, cycling, urban design, Chiang Mai

A STUDY ON INTERMODAL TRANSFERS OF PHETCHABURI STATION BY LINKING BANGKOK'S CANALS NETWORKS TO MASS RAPID TRANSIT LINES

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Abstract:

Traffic congestion in Bangkok has been well known at the world ranking for its unsolved situation. The sustainable solution for alleviate this aggravating situation of this megacity mobilization is a must to be recommended. Thus, this study aims to demonstrate the potential of hybrid canal-rail connectivity on a city-wide basis as well as more specific investigation on the development of canal-rail intermodal stations and nearby communities by employing the concept of Transit Oriented Development (TOD). Furthermore, it can be used to confirm the directive to revitalize Bangkok's canal network for water-based transport. This is due to the reason that Bangkok was originally a canal city with a canal web covering the present Bangkok Metropolitan Region with potentially connected to the modern rail transit systems. Additionally, this research reveals significant commuter preference for using a hybrid service. To achieve the goal of study, this research attempted to describe the characteristics of transit demand of commuters by targeting at the Phetchaburi Station which plays a significant role of interchange station in Bangkok Metropolitan Region (BMR). The 200 sets of questionnaire survey was distributed as tools for collecting information on transit demands, travel behaviors, and commuters' choices. The forecasting of transit demand was calibrated by using logit model in order to explore the effects of policy variables induced on modal usage. The results of study found that among those who are now using private cars, approximately two-thirds would turn to use the hybrid system instead. The uses of hybrid transit mode are partly based on the availability of park and ride facility. Finally, the success of in-

termodal transit highly depends on the nature of canal-rail connectivity. As a consequence, to promote intermodal behavior, the boat piers should be designed for promote seamless connectivity as close as possible to the rail transit stations.

Keywords: Intermodal, Canals Networks, Mass Rapid Transit Network, Bangkok, Sustainable Transportation.

ASSESSING THE TRENDS OF URBAN SPRAWL AND ITS ENVIRONMENTAL IMPACT ON BASINS OF MOUNTAINOUS REGIONS, CASE OF KIGALI, RWANDA

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Abstract:

Urban spatial growth of many mountainous cities is contributing a lot in degradation of the environment mainly its related services such as water infiltration and flood control. Kigali, the capital city of Rwanda, is one the city experiencing quick urban spatial growths and its consequences can be easily observed on slopes of its numerous mountains.

Unfortunately, this unplanned spatial expansion of human populations away from central urban areas previously hosting a natural vegetation, representing the so called urban sprawl, has in turn increased the frequency and magnitude of natural hazards, water and soil erosion. The purpose of this paper is twofold: to analyze the tendency of urban sprawl in relation to the topography, and to assess its impact on basins for introducing an ecological planning and consideration of environmentally sensitive areas as a relevant form of regulation and potential tool for planners to envision future urban growth scenarios.

Keywords: Urban Sprawl, Environmental Impact, Urban Planning

FINITE ELEMENT ANALYSIS OF THE GLUED LAMINATED TIMBER'S BEHAVIOR AND INFLUENCE OF THE GEOMETRICAL PARAMETERS TO ITS RESISTANCE

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Abstract:

The Glued Laminated Timber (GLT) is an innovative engineering structure, subjects to the green materials being friendly with environment, but strong resistance in comparison with the traditional timber structure. In the first part of this paper, we present a finite element model that allows predicting the mechanical behavior of the innovative glued laminated timber beams. The model presents good results of prediction when comparing between the numerical and experimental results. The second part is focused on evaluating of the influence of each geometrical parameter of finger-joint, such as the finger length, the tip gap, and the pitch, to the bearing resistance of the GLT in using the Taguchi's method.

Keywords: Glued laminated timber, engineering wood structure, finite element method, Taguchi's method.

STUDY ON IMPROVEMENT OF OFFICE VENTILATION SYSTEM FOR GOOD AIR QUALITY IN THE LOWLAND AREA OF THAILAND

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Abstract:

In the present, human activities often occur in indoor space more than outdoor space, and most of the buildings were installed air conditioning system, to make a comfortable environment for its occupants. Inadequate ventilation will affect the occupants' health; microorganism, airborne particles, VOCs, and household odors and gases are one of the causes of Sick building syndrome. This research focuses on buildings that were designed and used for 15-30 years, approximately, with indoor environment problems such as natural or mechanical ventilation systems installation. The selected sites were located in Bangkok, the central plain and in Phuket in an island, are located in lowland area of Thailand. In this research, the indoor air qualities in the three small office buildings were measured and estimated for recorded change of carbon dioxide concentration, temperature and, relative humidity in office hours. The level of CO_2 concentration that generates from humans and gas devices for office buildings should not be over than 1000 ppm. Although the average level of CO_2 does not affect human health directly, when it accumulates inside the body, it can cause disease. This research used CO_2 recorder TR-76Ui-S to measure CO_2, temperature, and humidity for five times; 8:00 - 10:00, 10:00 - 12:00, 12:00 - 13:00, 13:00 - 15:00, and 15:00 - 17:00 both inside and outside buildings in the same period. In the three target sites, the buildings have similar factors of not install mechanical ventilation system and the number of officers. The results showed that CO_2 in the office was increasing from morning to evening if the windows were not opened during the lunchtime and was CO_2level the highest before the employees get off work mainly on the midweek. To improve indoor air quality and follow ASHRAE Standard should install at least one of the ventilation system in the building.

Keywords: indoor air quality, carbon dioxide concentration, temperature, relative humidity, office building.

EVALUATION OF INDOOR THERMAL COMFORT IN BURMESE TRADITIONAL HOUSE DEPENDING ON THE TYPES AND LOCAL MATERIALS

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Abstract:

In ancient time, before modern technologies develop, people have used local materials to build their houses while attempting to get indoor thermal comfort in natural way. In this framework, Burmese traditional house will be analyzed in order to identify what kinds of local material has the ability to provide reasonable indoor thermal comfort. Burmese traditional house is one of the types of traditional houses in Myanmar and there are four different kinds of Burmese traditional house depending on the types and usage of local building material. The aim of this research is to achieve the design guideline of local building material in Myanmar which can be the best responsible approach to thermal comfort in natural way. The field survey was conducted in hot and humid region, Dala, Yangon, Myanmar. The measurement has done for 24 hours 18 days continuously. And it was conducted for the data of wind velocity, indoor and outdoor temperature with relative humidity, solar radiation record, surface temperature and infrared thermal images which are parameters to evaluate indoor thermal comfort. Based on the measurement results, it can be interestingly found that local materials such as woven crushed bamboo and Dani are efficient materials for indoor thermal comfort which can also apply back in constructing sustainable residence nowadays.

Keywords: Burmese traditional house; Indoor thermal comfort; Local indigenous building material.

PROSPECTS AND DESIGN PERSPECTIVES OF AN AEROTROPOLIS IN BANGLADESH: A CASE STUDY ON ISHWARDI

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Abstract:

Transport system integrated with different modes and locations is necessary to boost and maintain sustainable economy. Aerotropolis integrates speedy transportation, business, industry, housing facility and urban services. It plays a great role in providing access to places as well as promoting city image and living standard. This advanced urban planning concept emphasizes on the airport centric urban development. Bangladesh is struggling to foster the benefits of airport. Special concern on the air transport is needed to cope with the world's development. In Bangladesh most of the airports are underused, some are not used anymore. Ishwardi airport is such an airport with potentiality of local and regional development. Recently the government has taken some policy measures to improve the air transportation facilities and create new facilities throughout the country. Such emphasize gives strength in this research. The objectives of the research are firstly to analyze existing scenario of the Ishwardi airport and its surrounding areas. Secondly the prospects of developing an aerotropolis in this area is analyzed. Finally a design proposal for the aerotropolis development is provided linking with the existing transport network, industrial zone and urban area. This research has identified the surrounding cities and its connectivity corridor. More than 15 million people lives in the neighboring districts. All these people will get accessibility and be

benefited from the airport and aerotropolis. Ishwardi can be the center of access to the surrounding recreational and historical places. Analyzing the prospects of the airport this research suggested some proposals of site improvement. Finally it showed the layout design of aerotropolis in three sequential phases considering this aerotropolis as an economic and transportation hub of this region.

Keywords: Aerotropolis, Integrated transportation, Ishwardi, Prospects.

THE URBAN COASTAL AREA FOR TOURISM DEVELOPMENT IN VIETNAM - NEED OF INTEGRATED PLANNING AND SUSTAINABILITY

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Abstract:

Coastal tourism in the 21st century will be quite different compared to the previous period due to many reasons such as climate change, environmental pollution on land and in the sea, changes of socio-economics conditions and preferences of travelers (more emphasis on wilderness, untouched and intact landscapes and ecological integrity of the beach). Vietnam has a long coastal line and can offer good possibilities for tourism development in this direction. The experience of other countries, for example in total urbanization of coastal area (Spain) or (on the contrary) in coastal harmonization of existing cities, landscapes and agriculture (Germany) is particularly valuable for Vietnam. Based on the principles of coastal line management and the experience of other countries, this paper try to analyze systematically the current status of coastal tourism and urban coastal development in Vietnam. Generally, the main problems in this country are the inacceptable planning and development of urban coastal line such as in Danang, Hoi An, and others locations. This development is like Miami in United States and Spain in 1960s and 1970s; many coastal lines in Vietnam have been segmented and handover to the private investors for hundreds of years. This has violated the coastal protection Act and others, thereby the natural integrity of the coast has been lost, which has reversed the natural, socio-economic development of the region. The full involvement of local communities in the tourism sector, not only benefits them and the environment in general, but also improves the quality of the tourism experience. In the case of Sam Son beach (Thanh Hoa province), the new planning and rehabilitation of the exiting beach is necessary, but it does not guarantee integrated and sustainable planning, which leads to resistance of the fishermen and local inhabitants.

Keywords: Coastal area/region, coastal tourism, sustainable development of coastal area, urban coastal area.

STUDY ON CLASSIFICATION OF LOCATION NORMALIZATION PLAN

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Abstract:

In recent years, Japan aims to develop the city structure by combining the concept of compact city and transport network model. City planning organization is pushed forward to implement this conceptual plan and reorganized the planning structure. However, the location normalization plan system, which is the basis of the reorganization of urban planning is ambiguous in terms of standards and area setting. According to few studies have targeted this system and also less disclosed on techniques of quantitatively capture the plan. Therefore, this study aimed at grasping the current situation of the location normalization plan in 69 cities that being implemented nationwide and also obtaining basic knowledge for future implementation of the location normalization plan.

Keywords: Location normalization plan, Urbanization Promotion Area, City planning area, Classification, Statistical analysis

SENSOR NETWORK BASED CYBER PHYSICAL INFRASTRUCTURE FOR WATER SUPPLY NETWORK

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Abstract:

In this paper we give an overview of the Smart Water Network project at our research center. Water networks can be a perfect use case for a large scale Cyber Physical System (CPS). Converting the present water system into a smart water network is the need of the day, which in turn helps us achieve a safe, reliable and efficient water infrastructure to tackle the future water needs of the country. The goal of this project is to conduct various experiments in a lab scale test bed. Models and algorithms that are developed to optimize the performance of the water distribution network can be subsequently validated in a city level water transmission/distribution network. We are also in the process of building a data analytics platform, which can be used for prognosis and proactive decision making.

Keywords: Water distribution system, Leak Detection, Sensor networks, Data acquisition, Closed loop control system, Water network test bed, Internet of Things.

EVALUATION OF GRID PATTERN CITY IN TROPICAL ZONE CONSIDERING URBAN MORPHOLOGY VIEWING FROM SHADING ASPECT

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Abstract:

Since it has been many decades of studying about climatology, many researchers convinced that climate consideration in building and urban design became the fundamental principle. The impact on urban microclimate is basically governed by the city morphology, materialization and landscaping of neighborhood. The modification of these parameters, such as city pattern, building facets design, tree pattern and tree species, can help to be the healthy urbanism. This paper discusses about the evaluation of grid pattern city in tropical zone which is aging, but still use as central business district(CBD), considering urban morphology with respect to shading since the shading has supreme influence on thermal comfort. The purpose of this research is to investigate the shading condition of existing city pattern to know whether the city is still reasonable to live or not by analyzing urban morphological elements using Geographic information system(GIS), 3D modelling program (sketch up), Shading analysis tool, quantitative method and statistical analysis. The scheme of this research is divided into two main parts: evaluation by the effect of type of colonial style building facet and evaluation by the effect of tree pattern and different tree species. The result of this research will provide the hypothesis of urban morphology of the study area and appropriate design recommendation for Grid pattern city to maintain the old urban area in conformity with the tropical zone without vanishing the original image of the city.

Keywords: Grid pattern city, Tropical zone, Urban Morphology, Urban shading.

DYNAMIC SIMULATION OF ADAPTATION POLICY FOR FLOOD IMPACTS ON URBAN ACTIVITIES: A CASE STUDY OF KHON KAEN, THAILAND

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Abstract:

Climate change caused by global warming has increased the frequency of natural disasters such as floods, sea-level rise, torrential rain, etc. Especially in the case of Thailand, the frequency of flood events has increased about four times from 2001 to 2010. In general, floods greatly affect urban activities such as travel behavior, locational choice, and others. To minimize this effect in urban areas, adaptation policies are widely implemented. However, there has been scant research to evaluate the impact of adaptation policies on urban activities by taking into consideration the extent of floods. Therefore, in this study, we propose a dynamic model which considers the causal relationship between various factors to estimate the effect of adaptation policies on urban activities and the flood situation in a combined manner. As a case study, we chose Khon Kaen city in Thailand which has seen an increase in flood damages in recent years. In particular, we simulated the effect of adaptation policies on transportation and land use as it changes with the extent of flood damage. Specifically, in case of transportation, the vehicle kilometer traveled (VKT) for cars increases because parts of road networks in the urban area are inundated during floods. In terms of land use, we observe that many people reside in areas with high probability of flooding. To mitigate the transportation issue, our simulation suggested an adaptation policy that reduced the total travel time which leads to savings of 876 million THB for 20 simulation years. Further, our simulation also suggested an adaptation policy that dynamically computes low flood-prone zones. Consequently, we show that both of these adaptation policies contribute to mitigating the effect of floods on urban activities.

Keywords: Flood Impact, Urban Activity, Dynamic Simulation, System Dynamics, Adaptation Policy, Khon Kaen

A BASIC ANALYSIS ON URBAN LANDSCAPE CONTINUITY IN A LOWLAND URBAN HERITAGE USING DEEP LEARNING BASED METHOD

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Abstract:

Architectural intervention in urban heritage area requires several analyses and consultations and is usually subject to numerous parameters making the architectural designing task a complex time-consuming process. Façade analyses is also one of the required long-term tasks held by the architect, especially in urban heritage area where an important pressure concerning the harmony of the neighborhood is often faced.

Our research focus on one of this earliest stage preceding the architectural design, the architectural environment analyses, which is however of paramount importance.

In fact, being essential for an adequate architectural design, the architectural environment analyze is however time-consuming with a variable possibility of results and interpretations. Also, some of the actual analyses methods such as questionnaires, are archaic and lacks accuracy.

To address this issue, we here present a computer vision method for an automatic evaluation of the urban façade, by comparing a set of façade's pictures. Our target area is Hizenhamashuku, a town with two "preservation area of traditional buildings" located in Kashima city, which is a typical lowland city in Saga prefecture.

In this project we explore possibilities of how deep learning can boost the performance of urban facades study. Using Python 3.0, a programming language,

we will, in a first time, develop a model able to read and analyze pictures of a series of building from different historic eras with different historic styles.

This research will be a part of a more global process having as final aim to create a deep learning method based urban façade analysis tool. Not to mention general benefits of automated process such as speed and labor cost, statistical analysis can also provide theoretical justification for designers which is not typically available in the case of manual efforts.

Keywords: machine learning, urban façade, urban heritage preservation, architecture

FUNCTION QUALITY IMPROVEMENT OF MAHAKAM RIVERBANKS AS A PUBLIC OPEN SPACE

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Abstract:

The increasing numbers of people and buildings that continue to grow and tend to be uncontrolled in the settlement causing some negative impacts one of them is the consistency of land allotment. This has resulted in some impacts such as ineffective utilities and environmental infrastructures, no mitigation system, and the unavailability of space for public spaces and other supporting facilities that supposed to be available within a settlement. Kampung Arab is one of a densely populated settlements located in the middle of business center area of Manado City, occupies the Mahakam riverbank. The limited space available in Kampung Arab has caused the settlements tend to be slumed and doesn't have public open space as one of the residential support facilities. In addition, this settlement expands riverbanks so the functions of riverbanks become disturbed, and these settlements are often at risk of flooding. The purpose of this research is to analyze the function of Mahakam riverbanks against flood risk and to analyze the possibility of public space and pedestrian ways availability at the location of Mahakam riverbanks around the Kampung Arab settlement. The research method is qualitative descriptive method. Primary data were obtained through field observation, documentation, and interviews. The research is located in Kampung Arab settlement which occupies the banks of Mahakam river. Further analysis is done: 1) analysis of existing settlement of Kampung Arab to the mahakam river related to: building's orientation, river border, activity and behavior of society 2] analysis of public open space availability and it's for-

mer elements, 3] analysis of settlement utility system and at the final stage conducted an analysis related to community activities and behavior. Expected results through this research are: improving function and quality of mahakam river, restoring the function of riverbanks and public open space availability as social interaction space.

Keywords: Riverbanks, Quality Improvement, Public Open Space.

AN ANALYSIS ON EVACUATION TO HIGHER PLACES CONSIDERING CAPACITY OF SHELTERS IN A TRADITIONAL LOWLAND TOWN

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Abstract:

Japanese historic local towns are vulnerable to disasters because of their buildings aging structures and narrow streets. Besides, lowland towns don't have enough high shelters when flood disasters happen. Many researchers study on disaster preventions for such towns, but there are no studies considering capacities of shelters. In this study we inspect capacities of shelters in a traditional lowland town. Our study model area is a traditional town area located in Kashima, Saga prefecture, Japan, called Hizenhamashuku. This area is located in lowland, and has two important preservation districts of traditional buildings. We will consider some parameters such as the capacities of shelters, the number of residents, family structure, age, residents' perceptions on evacuation to higher places. We use two conditions as priority for simulation, namely shortest routes and higher routes. Our simulation clarified the evacuation tendency and the vulnerability of shelters and districts. Agents left their house after the beginning of the simulation, with a random difference in time of few minutes, in one of the 3 designated shelters direction (Hama public hall{HPH}, Toubu junior high school, Hama elementary school). Agents went to higher places such as Hama public hall and Toubu junior high school. The difficulty of the evacuation in terms of capacities of shelters was analyzed and indicated in digital maps. Results of simulations had shown that agents from the part around HPH has had difficulties for evacuation. The results could be summarized as followings: First, the capacity of HPH as a higher

place shelter is not enough regarding the number of residents around it when disasters happen. Second, contraflow of evacuees prevents them from their own evacuation. Third, when flood disasters happen, this problem becomes more prominent. Furthermore, considering the distribution of residents and their ages while shelters planning should make evacuation more smoothly and safely.

Keywords: Traditional town, Lowland, Capacity of Shelter, Evacuation, higher Place

NEIGHBORHOOD PARK FACILITIES IN UTTARA MODEL TOWN, DHAKA: DESIGN STANDARDS AND USER PERCEPTION BASED EVALUATION

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Abstract:

Neighborhood Park is considered as a key element of neighborhood development and formation of a vibrant community. The purpose of this study is to make a comparison of parks' facilities with standards of American Society of Civil Engineers (ASCE) by identifying the existing facilities of seven neighborhood parks (marked as P1 to P7) in Uttara Model Town, Dhaka. Furthermore, a comparative evaluation of the parks' facilities is made here based on users' perception by using Consumer Satisfaction Index (CSI). Study results indicated mentionable availability of sitting arrangement, signage, security light and walkway are in all these parks. Litterbin, food and drinking facilities and washroom are inadequate in number as compared with the standards. However, optional facilities such as exercise station, restroom and covered pavilion are literally absent. This is observed that parks facilities of P1 are mostly comply with the ASCE standards followed by P5, whereas compliance of P7 is the least among the parks. Values of CSI indicated that sitting arrangements and signage are comparatively better in these parks; whereas the conditions of garbage bins and shelters are not satisfactory. Poor management and maintenance mainly catalyze the deteriorating conditions of these facilities. The aggregate CSI values of parks indicated that, conditions of parks facilities are well in P4 (2.91) followed by P5 (2.07). In contrary, the states of park facilities are very poor in P7 (1.47) and P3 (1.54). The concept of 'Neighborhood Park' is relatively new in Bangladesh and no planning and design standards are maintained to make this particular type of park more functional and attrac-

tive. Therefore, a distinct gap is observed between the existing and the standard provision of facilities. The findings of this study are critical in improving the facilities in terms of quantity and quality as well as formulating pertinent native standard.

Keywords: Neighborhood Park, Park Facilities, Design Standards, Consumer Satisfaction Index (CSI), Uttara Model Town.

SUBURBANIZATION AND TRANSIT-ORIENTED DEVELOPMENT APPLIED FOR MONORAIL SYSTEM FROM BIEN HOA CITY TO METRO 01

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Abstract:

The aims of the research are to take an overview of the transit- oriented development, assess the status of the public transportation; make a survey in combination with investigation to make proposal for the development of the monorail connecting from Bien Hoa City to Ho Chi Minh Metro line 1 in the future. The development of this monorail system with TOD will serve the purpose of improving the public transportation system, meeting the travel demand with high quality service at reasonable costs, reducing traffic jams and traffic accidents, in line with the sustainable development of the transportation system of Vietnam in the future.

Keywords: monorail, public - transport, transit oriented development; sustainable development; urban city