

Memorandum



Date: September 1, 2022

To: Honorable Chairman Jose “Pepe” Diaz
and Members, Board of County Commissioners

From: Honorable Daniella Levine Cava
County Mayor

Subject: Resolution Approving and Authorizing Execution of an Interlocal Agreement Between Florida International University and Miami-Dade County for Research, Analysis, and Other Services for the Miami-Dade Water and Sewer Department

Agenda Item No. 8(O)(2)

Resolution No. R-833-22

EXECUTIVE SUMMARY

This item seeks approval from the Board of County Commissioners (Board) to enter into and execute a five-year Interlocal Agreement (“Agreement”) with Florida International University (“FIU”) through which FIU will provide research, analysis and other services to support the advancement of resource and process efficiencies in water and wastewater utility planning and operational efforts for the Miami-Dade Water and Sewer Department (WASD). Such services will be managed with the issuance of individual task-oriented work orders. A copy of the Agreement is attached the accompanying resolution as Exhibit 1.

Recommendation

Pursuant to Sections 2-9 and 2-10 of the Miami-Dade County Code, it is recommended that the Board approve Agreement No. 22FIU005, between Miami-Dade County and FIU, for a contract term of five years with a total compensation amount not to exceed of \$3,300,000, including a ten percent (10%) contingency allowance. This item was prepared by WASD.

Scope

FIU students and faculty from various campus locations will provide research, analysis, and other services to WASD through this Agreement, which will have a countywide impact.

Fiscal Impact/Funding Source

The funding source is operating revenues with a fiscal impact of \$3,300,000 over the course of the Agreement’s five-year term. The County’s Fiscal Year 2022-2023 Adopted Budget includes approximately one-third (\$1,000,000) of the total compensation dollar amount of this Agreement. Future funding will be determined during the annual budget approval process over the life of the Agreement.

Delegated Authority

This item authorizes the County Mayor or County Mayor’s designee to execute the Agreement and to exercise any and all rights conferred herein

Track Record/Monitor

WASD’s Deputy Director, Planning, Regulatory Compliance, and Capital Infrastructure, Marisela Aranguiz, P.E. will monitor this Agreement.

Background

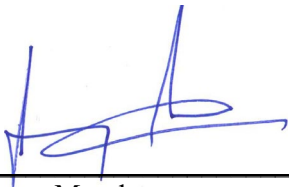
On January 25, 2007, the Board adopted Resolution R-69-07 directing staff to explore opportunities to enter into interlocal agreements with local universities for services required by the County. WASD identified an opportunity for FIU to facilitate and accelerate technology transfer from research to practice and promote

collaboration between researchers and water and wastewater planning and operations. The Board authorized this collaboration through two previous five-year agreements approved through Resolution Nos. R-1172-07 and R-50-12. Additionally, on May 7, 2019, the Board approved, via Resolution No. R-505-19, a three-year agreement with FIU for \$1,650,000, including a ten percent (10%) contingency allowance (“May 2019 Agreement”).

The May 2019 Agreement resulted in ten (10) task authorizations, valued at \$750,000, which utilized a combination of students and faculty members in areas as diverse as regulatory compliance, energy efficiency, water conservation, water & wastewater treatment, and groundwater modeling support. The May 2019 Agreement will expire on May 22, 2022, so the County now seeks approval of a new five (5) year Agreement with FIU.

If approved, this new Agreement enables FIU’s continued collaboration with WASD for research, analysis, and services, as needed and approved through available funding and task authorizations, in the areas of: (1) water use efficiency; (2) water quality and wastewater treatment; (3) energy efficiency; (4) hydraulic and groundwater modeling; (5) emerging technologies for drinking water and wastewater treatment; (6) infrastructure resilience; (7) marketing and customer engagement; and (8) data analytics. Attachment A to the Agreement includes a description of the diverse schools of discipline accessible through this Agreement.

This Agreement will result in expenditures at the local level while promoting academic opportunities for area students serving as a public resource to perform research of significance to the South Florida region.



Jimmy Morales,
Chief Operations Officer



MEMORANDUM

(Revised)

TO: Honorable Chairman Jose "Pepe" Diaz
and Members, Board of County Commissioners

DATE: September 1, 2022

FROM: 
Gen Bonzon-Keenan
County Attorney

SUBJECT: Agenda Item No. 8(O)(2)

Please note any items checked.

- _____ "3-Day Rule" for committees applicable if raised
- _____ 6 weeks required between first reading and public hearing
- _____ 4 weeks notification to municipal officials required prior to public hearing
- _____ Decreases revenues or increases expenditures without balancing budget
- _____ Budget required
- _____ Statement of fiscal impact required
- _____ Statement of social equity required
- _____ Ordinance creating a new board requires detailed County Mayor's report for public hearing
- _____ No committee review
- _____ Applicable legislation requires more than a majority vote (i.e., 2/3's present ____, 2/3 membership ____, 3/5's ____, unanimous ____, CDMP 7 vote requirement per 2-116.1(3)(h) or (4)(c) ____, CDMP 2/3 vote requirement per 2-116.1(3)(h) or (4)(c) ____, or CDMP 9 vote requirement per 2-116.1(4)(c)(2) ____ to approve
- _____ Current information regarding funding source, index code and available balance, and available capacity (if debt is contemplated) required

Approved _____ Mayor
Veto _____
Override _____

Agenda Item No. 8(O)(2)
9-1-22

RESOLUTION NO. R-833-22

RESOLUTION APPROVING, PURSUANT TO SECTION 2-9 AND 2-10 OF THE MIAMI-DADE COUNTY CODE, AN INTERLOCAL AGREEMENT BETWEEN MIAMI-DADE COUNTY AND FLORIDA INTERNATIONAL UNIVERSITY, AGREEMENT NO. 22FIU005, FOR RESEARCH, ANALYSIS, AND OTHER SERVICES FOR THE MIAMI-DADE WATER AND SEWER DEPARTMENT FOR A TOTAL AMOUNT OF COMPENSATION NOT TO EXCEED \$3,300,000.00, INCLUDING A 10 PERCENT CONTINGENCY ALLOWANCE, FOR A FIVE YEAR TERM; AND AUTHORIZING THE COUNTY MAYOR OR COUNTY MAYOR'S DESIGNEE TO EXECUTE SAME AND EXERCISE ANY AND ALL PROVISIONS CONFERRED THEREIN

WHEREAS, this Board desires to accomplish the purposes outlined in the accompanying memorandum, a copy which is incorporated herein by reference,

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF MIAMI-DADE COUNTY, FLORIDA, that this Board hereby authorizes the execution of an Interlocal Agreement, pursuant to sections 2-9 and 2-10 of the Miami-Dade County Code, between Miami-Dade County and Florida International University, Agreement No. 22FIU005, for research, analysis, and other services for the Miami-Dade Water and Sewer Department for a total amount of compensation not to exceed \$3,300,000.00, including a 10 percent contingency allowance, for a five year term, in substantially the form attached hereto as Exhibit 1 and made a part hereof. The Board also authorizes the County Mayor or County Mayor's designee to execute same for and on behalf of Miami-Dade County, Florida and to exercise the provisions contained therein.

The foregoing resolution was offered by Commissioner **Sally A. Heyman**,
 who moved its adoption. The motion was seconded by Commissioner **Rebeca Sosa**
 and upon being put to a vote, the vote was as follows:

Jose "Pepe" Diaz, Chairman			
Oliver G. Gilbert, III, Vice-Chairman			
Sen. René García	absent	Keon Hardemon	aye
Sally A. Heyman	aye	Danielle Cohen Higgins	aye
Eileen Higgins	aye	Joe A. Martinez	absent
Kionne L. McGhee	aye	Jean Monestime	aye
Raquel A. Regalado	aye	Rebeca Sosa	aye
Sen. Javier D. Souto	aye		

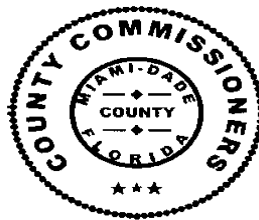
The Chairperson thereupon declared this resolution duly passed and adopted this 1st day of September, 2022. This resolution shall become effective upon the earlier of (1) 10 days after the date of its adoption unless vetoed by the County Mayor, and if vetoed, shall become effective only upon an override by this Board, or (2) approval by the County Mayor of this resolution and the filing of this approval with the Clerk of the Board.

MIAMI-DADE COUNTY, FLORIDA
 BY ITS BOARD OF
 COUNTY COMMISSIONERS

HARVEY RUVIN, CLERK

Basia Pruna

By: _____
 Deputy Clerk



Approved by County Attorney as
 to form and legal sufficiency.

SED

Sarah E. Davis

**INTERLOCAL AGREEMENT
BETWEEN MIAMI-DADE COUNTY AND
FLORIDA INTERNATIONAL UNIVERSITY
AGREEMENT NO. 22FIU005**

THIS AGREEMENT made and entered into this _____ day of _____, 2022 (“Effective Date”), by and between MIAMI-DADE COUNTY, FLORIDA, a political subdivision of the State of Florida (hereinafter referred to as the "COUNTY"), and THE FLORIDA INTERNATIONAL UNIVERSITY BOARD OF TRUSTEES, its successors or assigns, a public body corporate of the State of Florida (hereinafter referred to as the "UNIVERSITY", and collectively with the COUNTY, the “Parties”).

For and in consideration of the mutual agreements hereinafter contained, the COUNTY hereby retains the UNIVERSITY to, and the UNIVERSITY hereby covenants to, provide the services described herein to support the advancement of resource and process efficiencies in water and wastewater utility planning, operations and public outreach and engagement (hereinafter referred to as the "Project").

WITNESSETH

WHEREAS, the COUNTY has a long record of accomplishment in implementing policies and initiatives to address climate change, environmental protection and other sustainability issues, including energy efficiency and water conservation; and

WHEREAS, on May 7, 2019, the Board of County Commissioners, via Resolution R-505-19, approved an Interlocal Agreement with the UNIVERSITY for research analysis and other services for the Miami-Dade Water and Sewer Department (WASD) for a total amount of compensation of \$1,650,000.00, including a ten percent (10%) contingency allowance, for a three-year term; and

WHEREAS, the COUNTY would like to continue to collaborate with the UNIVERSITY to facilitate and accelerate technology transfer from research to practice; promote collaboration between researchers and the industry; and serve as a public resource to perform research, analysis, and other services of significance to the South Florida region; and

WHEREAS, the UNIVERSITY agrees to continue to provide the COUNTY with interdisciplinary technical support and the services described in this Agreement,

NOW, THEREFORE, in consideration of the mutual terms, conditions, covenants and payments hereinafter set forth, the COUNTY and the UNIVERSITY agree as follows:

1. COUNTY’S OBLIGATIONS AND AUTHORIZATION TO PROCEED: The COUNTY agrees that WASD shall furnish to the UNIVERSITY any plans or other data available in the COUNTY files pertaining to the work to be performed under this Agreement. Information shown on such plans or data shall be that which has been made available to the COUNTY and shall be provided to the UNIVERSITY without any guarantee regarding its reliability and accuracy. The UNIVERSITY shall be responsible for independently verifying such information if it shall be used by the UNIVERSITY to accomplish the work undertaken pursuant to this Agreement.

The UNIVERSITY shall submit a proposal for a statement of work upon the request of the Director of WASD (hereinafter referred to as the "Director") prior to the COUNTY'S issuance of a task authorization to proceed. No payment shall be made to the UNIVERSITY for time or service in connection with the preparation of any such proposal. The Director or the Director's designee shall confer with the UNIVERSITY before any task authorization to proceed is issued in order to discuss and agree upon the scope, time for completion, and fee for services to be rendered pursuant to the task orders, subject to the conditions of this Agreement. WASD reserves the right to interview the UNIVERSITY staff and/or students who will be providing services on a task, including any graduate and post-doctoral research assistants.

The Director shall issue written task authorizations to proceed to the UNIVERSITY for each statement of the work to be performed hereunder. In case of emergency, the COUNTY, through the Director, reserves the right to issue oral authorizations to the UNIVERSITY with the understanding that written authorization shall follow within ten (10) calendar days. If no written authorization is issued within that time, the UNIVERSITY shall cease work and submit an invoice for work completed and costs incurred or encumbered.

2. UNIVERSITY'S SERVICES: In order to support the advancement of resource and process efficiencies in water and wastewater utility planning, operations and public outreach and engagement, the UNIVERSITY shall perform research, analysis, and other services as detailed in task authorizations as set forth in Section 1 above, through the schools, colleges and institutes listed on Attachment A. Oral and written proficiency in the English language is required for individuals providing services to WASD on behalf of the UNIVERSITY. The nature of the work that may be performed by the UNIVERSITY includes the following:

A. Water Use Efficiency: Water use efficiency data gathering and analysis; evaluation of water use efficiency projects and initiatives; production of water conservation reports; research on water use efficiency trends and best management practices; and updating of water use efficiency reporting tools and other water use efficiency project support.

B. Water and Wastewater Treatment Management: Detailed water and wastewater lab analysis, including preparation of cost breakdowns and collection of samples; utilization of field water quality meters for testing of plant operating parameters, including but not limited to, pH, temperature, dissolved oxygen, oxidation reduction potential, turbidity and total dissolved solids performance of function and data validation of on-line instrumentation; assistance to plant engineers in day-to-day tasks and long term projects; preparation of small/short term engineering projects; and assistance to WASD with water quality sampling and analysis to support resilient water and wastewater management and environmental quality.

C. Energy Efficiency: Analysis and interpretation of energy consumption data of WASD infrastructure, including buildings, water treatment facilities, wastewater treatment facilities and pumping stations via EnergyCap; assistance with implementation of the Energy Efficiency Master plan, which assistance may include the formation of energy teams, development of an online pledge, and implementation of energy efficiency measures and special projects; support for the production of energy reports; assistance with

identification of relevant data for report preparation; design of graphs and charts regarding energy consumption trends for reporting; assistance with research and analysis of energy consumption reduction for specific processes; and assistance with updating of energy efficiency reporting tools.

D. Hydraulic Modeling: Performance of modeling, including but not limited to, gravity sewer modeling, force main/pumpstation modeling, and water transmission and distribution modeling, including fire flow analysis; and as-built collection water resources modeling, including groundwater/surface water modeling, hydrologic/hydraulic modeling, and water quality modeling.

E. Water and Wastewater Treatment Technologies: Literature and research reviews regarding emerging drinking water and wastewater treatment technologies, including alternate disinfection, filtering, membrane, desalination, nutrient removal technologies, and chemicals of concern removal (i.e. PFAS).

F. Resilience: Monitoring and researching regarding the impacts of climate change on utility infrastructure and operations; assist with research and analysis of technologies and strategies for increasing infrastructure resilience through adaptive measures that address impacts of sea level rise and other climate change impacts.

G. Public Affairs: Assistance with creation of content for social media channels; research regarding social media trends; initiation of programs to increase customer engagement; preparation of fact sheets, press releases and newsletter articles; and attendance at outreach events.

H. Data and Asset Management: Assistance to WASD in identifying, analyzing, tracking and reporting key data indicators to be used to measure resilience, asset conditions, informed decision-making, and benchmarking and reporting progress.

I. Miscellaneous: Assistance with data collection and sampling. In addition, individuals performing work on behalf of the UNIVERSITY under this Agreement may be required to travel and provide personal protective equipment, including clothing, helmets, goggles and protective shoes.

3. UNIVERSITY'S RESPONSIBILITIES: In connection with the professional services to be rendered pursuant to this Agreement, the UNIVERSITY agrees to:

- A. Use that degree of care and skill ordinarily exercised by other similar professionals in the field under similar conditions.
- B. Maintain an adequate staff of qualified personnel on the work at all times to ensure its completion within the term specified in the applicable task order authorization to proceed.
- C. Comply with the federal, state and local laws or ordinances applicable to the work.
- D. Obtain applicable laboratory certification and/or accreditation for parameters analyzed.
- E. Cooperate fully with the COUNTY in the scheduling and coordination of all phases of the work.
- F. Provide a written report on the status of the work to the Director or the Director's designee upon request and hold pertinent data and other products open to the inspection

of the Director or the Director's designee at any reasonable time and during normal business hours.

- G. Submit for COUNTY review any data representative of the work's progress at the percentage stages of completion which may be stipulated in the applicable task order authorization. Submit for COUNTY approval the final work products upon incorporation of any modifications requested by the COUNTY during any previous review. Any modifications that require an increase in costs or time to complete shall require an amended task authorization in order to be effective.
 - H. Confer with the COUNTY at any reasonable time during the term of the AGREEMENT and implement improvements for which the UNIVERSITY has provided research and analysis services. The UNIVERSITY shall not be compensated for the correction of errors and omissions on the part of the UNIVERSITY
 - I. Use computer and networking hardware, software and firmware standards as approved by the Information Technology (IT) Division of WASD. IT staff must be involved in the design phase of an application and in developing the testing, training and acceptance criteria of the application before it is placed into production. All applications and/or systems to be transferred to the COUNTY must have adequate end user and systems support documentation and, as part of the design process for a Project, any system needs should be identified and will require the approval of IT. All electronic data performed or produced in the performance of this Agreement shall be transferred in an approved media and format by IT.
4. TASK AUTHORIZATION: TIME FOR COMPLETION: The services to be rendered by the UNIVERSITY for each Section of the Project shall commence upon receipt acceptance by the UNIVERSITY of a written task order authorization to proceed from the Director or the Director's designee subsequent to the execution of this Agreement and shall be completed within the time stated in the accepted task authorization.
5. DELAY IN PERFORMANCE: No claim for damages or any claim other than for an extension of time shall be made or asserted against the COUNTY by reason of any delays. The UNIVERSITY shall not be entitled to an increase in this Agreement sum or payment or compensation of any kind from the COUNTY or direct, indirect, consequential, impact or other costs, expenses or damages, including but not limited to, costs of acceleration or inefficiency arising because of delay, disruption, interference or hindrance from any cause whatsoever; provided, however, that this provision shall not preclude recovery or damages by the UNIVERSITY for hindrances or delays due solely to fraud, bad faith or active interference on the part of the COUNTY or its agents. Otherwise, the UNIVERSITY shall be entitled only to extensions of time as the sole and exclusive remedy for such resulting delay in accordance with and to the extent specifically provided below.

The time to perform this Agreement shall be extended only if the UNIVERSITY is delayed in performing any obligation under this Agreement due to a force majeure or inevitable accident or occurrence. In order to request an extension of time for a force majeure or inevitable accident or occurrence, the UNIVERSITY shall request in writing a time extension from the Director within ten (10) calendar days of said force majeure event or inevitable accident or occurrence. Failure to make such written request within the specified time shall be a bar on the ability of the UNIVERSITY to bring any civil action for either compensable or non-compensable time extension.

6. COMPENSATION: The COUNTY agrees to pay, and the UNIVERSITY agrees to accept, a fee representing full compensation for the performance of the services specified herein. The UNIVERSITY shall submit monthly invoices for all work in progress using a format and procedure provided by WASD. Invoices shall be submitted within one hundred twenty (120) calendar days of the performance of the service being billed. The COUNTY shall not pay invoices that are not properly submitted within that period. Additionally, the COUNTY may withhold payment of any invoices from the UNIVERSITY if the COUNTY determines that the UNIVERSITY submitted and received payment of an inaccurate invoice, without limitation to any other legal or equitable remedies. Fees and other compensation will be computed in accordance with one or a combination of the methods outlined below as specified in a written task authorization:

- A. Fee for Services as a Multiple of Direct Salary Cost and Fixed Hourly Rate: It is mutually agreed and understood that the following provision shall be applicable to this Agreement. The fee for research and analysis services rendered by the UNIVERSITY's faculty and students shall be computed based on the direct salary cost, as reported to the Internal Revenue Service, excluding bonuses or awards, if applicable, for the time of said faculty and students engaged directly in the work times a multiplier of 1.45 for expenses incurred for all faculty and students. The UNIVERSITY shall invoice the COUNTY for work performed as detailed in the task authorization in a format acceptable to the COUNTY. This fee shall constitute full compensation to the UNIVERSITY for costs incurred in the performance of the work such as salaries, overhead, fringe benefits, operating margin and all other costs not covered by reimbursable expenses.
- B. Lump Sum Fee: The fee for any requested portion of Work may be, at the option of WASD, a lump sum mutually agreed upon by the Director or the Director's designee and the UNIVERSITY. The lump sum fee will be estimated based on the direct salaries times the negotiated multiplier times the hours per employee. Designated lump sum fees shall be stated in the written task authorization to proceed. Lump sum fees shall NOT include any reimbursable expenses, which must be separately accounted and paid on the basis of original receipts and actual costs.
- C. Reimbursable Expenses: The UNIVERSITY may be compensated for certain work-related expenditures not covered by fees for research and analysis services, provided such expenditures are previously authorized by the Director or his designee in writing. Reimbursable expenses may include, but are not limited to:

Expenses for laboratory tasks and analyses, permitting fees, printing reproduction costs, technical supplies, and rental or purchase of specialized equipment and instruments necessary for the efficient performance of the work, provided that such equipment, technical supplies and instruments become the property of the COUNTY upon work completion. Reimbursable expenses also include tolls and specialized clothing necessary for completion of tasks assigned beyond that required by Section 2(I) above. Specialized clothing shall be detailed in the budget for the task authorization.

Travel out of Miami-Dade County by UNIVERSITY staff must be approved in advance by the WASD Director or his designee. Travel included in a budget in an executed task authorization shall be deemed approved by the WASD Director. Whenever travel costs

are incurred, they will be subject to either the provisions of Miami-Dade County Administrative Order 6-1 or Section 1004.22, Fla. Stat., whichever is more restrictive.

- D. **Maximum Compensation:** The total of all payments to the UNIVERSITY pursuant to this Agreement shall not exceed three million dollars (\$3,000,000.00), excluding the contingency allowance set forth in Section 6.E below. No minimum amount of compensation is guaranteed to the UNIVERSITY.
- E. **Contingency Allowance Account:** In the event that a contingency necessitates the performance of services or additional services by the UNIVERSITY after the three million dollars (\$3,000,000.00) maximum compensation limit of the Agreement has been encumbered, the Director or the Director's designee shall have the right to authorize performance of additional services, provided that compensation for such services does not exceed ten percent (10%) of the Agreement maximum compensation limit, which maximum contingency allowance amount shall be three hundred thousand dollars (\$300,000.00). Before any additional services are begun, a task authorization to proceed from the Director shall be given to the UNIVERSITY. The task authorization to proceed must clearly identify, explain and justify the reason for the additional services. The UNIVERSITY shall have no entitlement to any of these funds. The COUNTY retains all rights to the Allowance Account funds, may expend these funds at its sole discretion, and any funds not expended from this Allowance Account remain the property of the COUNTY.
7. **DURATION OF AGREEMENT:** This Agreement shall remain in full force and effect for a period of five (5) years after the Effective Date. Actual completion of task authorizations authorized prior to the expiration date may extend beyond such term and shall be subject to the same terms and conditions set forth in this Agreement, including but not limited to, indemnification and insurance or until depletion of the funds allocated to pay the cost of the services described herein, whichever occurs first. This Agreement may be terminated by mutual consent of the Parties hereto or as otherwise provided herein. The performance of specifically and properly authorized Services that may extend beyond this Agreement's term shall be compensated in accordance with Section 6 herein.
8. **METHODS OF PAYMENT:** The UNIVERSITY is responsible for submitting invoices that do not contain charges that are more than one hundred twenty (120) days old. In the case where disallowed charges are found, the COUNTY may return the entire invoice for correction and resubmittal. Where WASD decides to utilize the Lump Sum form of payment for a task authorization, the following method will be utilized:
- A. The UNIVERSITY shall submit the invoice in a format provided by WASD. Each invoice shall reference the particular task order authorization to proceed that authorized the services and shall include a status report describing work completed.
- B. The amount due on the invoice shall be calculated by applying the percentage of the total work completed to date to the authorized amount in an approved task authorization and subtracting any previous billings. Alternatively, a task authorization may detail payments for stated deliverables or based on a payment schedule, in which case, the UNIVERSITY shall issue invoices for payment upon completion of each such deliverable or in accordance with the payment schedule in the task authorization.

C. Payments shall be calculated on a percentage of work completed or on a deliverable completion basis or pursuant to the payment schedule in the task authorization. Proper documentation will be maintained and provided to WASD for eligible reimbursable expenses. The UNIVERSITY shall maintain documentation for all expenses submitted for reimbursement in its regular course of business. Reimbursement requests shall be promptly submitted no more than thirty (30) calendar days after the expense.

9. SCHEDULE OF WORK: WASD shall have the sole right to determine on which units or sections of the work the UNIVERSITY shall proceed and in what order. The written task authorization to proceed issued by the Director or the Director's designee shall cover in detail: the scope, time for completion and compensation for the UNIVERSITY services requested in connection with each unit or section of work.
10. RIGHTS OF DECISIONS: All services shall be performed by the UNIVERSITY to the satisfaction of the Director or the Director's designee who shall decide all questions, difficulties, and disputes of whatever nature which may arise under or by reason of this Agreement; the prosecution and fulfillment of the services hereunder; and the character, quality, amount and value thereof. The Director's decisions upon all claims, questions and disputes shall be final, conclusive and binding upon the Parties hereto unless such determination is clearly arbitrary or unreasonable. In the event the UNIVERSITY does not concur with the decisions of the Director, the UNIVERSITY shall present any such objections in writing to the County Mayor. The Director and the UNIVERSITY shall abide by the decisions of the County Mayor. The decision of the County Mayor shall be subject to review de novo by a court of competent jurisdiction in Miami-Dade County.
11. FORCE MAJEURE: No Party shall be liable for its failure to carry out its obligations under the Agreement during a period when such Party is rendered unable, in whole or in part, by force majeure to carry out such obligations, but the obligation of the Party or Parties relying on such force majeure shall be suspended only during the continuance of any inability so caused and for no longer period of said force majeure event, and such cause shall, so far as possible, be remedied with all reasonable dispatch.

It is further agreed and stipulated that the right of any Party hereto to excuse its failure to perform by reason of force majeure shall be conditioned upon such Party giving, to the other Party or Parties, written notice of its assertion that a force majeure delay has commenced within ten (10) calendar days after such commencement, unless there exists good cause for failure to give such notice, in which event, failure to give such notice shall not prejudice any Party's right to justify any non-performance as caused by force majeure unless the failure to give timely notice causes material prejudice to the other Party or Parties.

For the purpose of this Paragraph, force majeure shall mean an act of God which includes but is not limited to: sudden, unexpected or extraordinary forces of nature such as hurricanes, floods, washouts, storms, fires, earthquakes, landslides, epidemics, explosions or other forces of nature. Inevitable accidents or occurrences shall mean those which are unpreventable by the UNIVERSITY and shall include but not be limited to: strikes, lockouts, other industrial disturbances, wars, blockades, acts of public enemies or terrorism, insurrections, riots, federal, state, COUNTY and local governmental restraints, military action, civil disturbances, explosions, conditions in federal, state, COUNTY and local permits, bid protests, manufacturing and delivery delays, unknown or unanticipated

soil, water or ground conditions and cave-ins. Provision of the above specified notice shall be a condition precedent to maintenance of a claim for delay.

Such acts or events do not include inclement weather (except as noted above) or the acts or omissions of subconsultants, materialmen, suppliers or their subcontractors, unless such acts or omissions are otherwise encompassed by the definition set forth above.

12. OWNERSHIP OF INTELLECTUAL PROPERTY: The following terms shall apply to each task authorization executed pursuant to this Agreement: "Intellectual Property" means individually and collectively all inventions, improvements and/or discoveries, patentable or unpatentable, copyrightable or uncopyrightable, including but not limited to mask works, computer software, both object and source code, data bases and other works of authorship. "Background Intellectual Property" means all Intellectual Property in existence prior to the execution date of this Agreement or that was developed unrelated to the subject matter of this Agreement or a task authorization executed pursuant to this Agreement. The Background Intellectual Property of each Party is and shall remain that Party's separate property. Neither Party shall acquire any claim to or right in any Background Intellectual Property of the other Party by virtue of this Agreement.

"Project Intellectual Property" means Intellectual Property developed during the performance of a task authorization pursuant to this Agreement. If Project Intellectual Property is developed solely by one of the Parties to this Agreement, it shall be owned solely by that Party (the "Owning Party") in accordance with Fla. Stat. Section 1004.23 in the case of the UNIVERSITY. The Owning Party hereby grants a royalty-free non-exclusive license to the other Party and to any third parties designated by the other Party to use the Owning Party's Project Intellectual Property for future research and academic purposes and/or for governmental purposes in the case of the COUNTY. If Project Intellectual Property is developed jointly by the Parties to this Agreement, by the UNIVERSITY at the request of the COUNTY, or by the UNIVERSITY as part of compensable work under this Agreement, it shall be jointly owned by the Parties on the basis of an undivided one-half interest by both Parties. If either Party believes that any jointly owned Project Intellectual Property is patentable, the Parties shall negotiate in good faith the roles and responsibilities of the Parties regarding the right to file, prosecute and maintain such patent applications for the jointly owned Project Intellectual Property. The rights set forth herein shall be subject to the rights of the U.S. Government, if any.

13. NOTICES: All notices, reports or other written communications from the UNIVERSITY to the COUNTY required pursuant to the terms hereof may be sent by first class United States Mail, facsimile transmission, electronic mail, certified mail or hand delivered to the Director or the Director's designee. All notices, reports or other written communications from the COUNTY to the UNIVERSITY required pursuant to the terms hereof may be sent by first class United States Mail, facsimile transmission, electronic mail, certified mail or hand delivered to the UNIVERSITY's authorized representative. All such notices or other communications will be deemed to have been given and received: (i) upon receipt if personally delivered; (ii) on the transmission date for facsimile and email communications if such transmission was made on a business day, or if not, then on the next business day, if such transmission is error-free; or (iii) three (3) business days after posting in the U.S. Mail for any communication that is sent by first class U.S. mail or certified mail.

Miami-Dade Water and Sewer Department
 Director
 3071 S.W 38 Avenue, 5 Floor
 Miami, Florida 33146

Florida International University
 Regnier Jurado, Director
 Program Administration, Research
 11200 SW 8th Street, MARC 430
 Miami, FL 33199

14. PRESS RELEASES OR OTHER PUBLIC COMMUNICATION AND PUBLICATION:
 The UNIVERSITY employees and students may publish peer-reviewed scholarly articles, abstracts, theses and similar documents concerning research work performed pursuant to this Agreement ("Research Publications"); provided that, at least sixty (60) days prior to such publication, the UNIVERSITY shall furnish to the COUNTY a copy of the proposed manuscript, and the COUNTY shall have thirty (30) days after receipt of the same to object in writing if the COUNTY deems that such manuscript discloses Confidential Information owned by the COUNTY, or patentable subject matter owned by the COUNTY. Additionally, the UNIVERSITY shall not name the COUNTY nor any COUNTY employee in the publication unless the COUNTY provides prior written authorization. If the COUNTY does not provide any written objection to the UNIVERSITY within the thirty (30) day review period, the UNIVERSITY shall be free to proceed with such publication. If, during the thirty (30) day review period, the COUNTY provides the UNIVERSITY with written objections regarding the disclosure of patentable subject matter owned by the COUNTY, the UNIVERSITY shall refrain from making such publication for a reasonable period of time, not to exceed ninety (90) days, to enable a patent application to be prepared and filed by the COUNTY. If, during the thirty (30) day review period, the COUNTY provides the UNIVERSITY with written objections regarding the disclosure of Confidential Information owned by the COUNTY or that the COUNTY or any COUNTY employee is named in the publication, the COUNTY and the UNIVERSITY shall work together to revise the manuscript, as necessary, so that such Confidential Information is not disclosed and neither the COUNTY nor any COUNTY employee is named in the publication. To the extent that the COUNTY has any additional comments relating to the proposed publication, the UNIVERSITY will take such comments into consideration if such comments are provided within the thirty (30) day review period; however, the technical and scientific analyses and conclusions in the publication shall at all times and in every event be determined solely by the UNIVERSITY.

The following disclaimer must appear in the publication relating to the work performed under this Agreement: "The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies or endorsements, either expressed or implied, of Miami-Dade County, Florida or WASD."

For Non-Research Deliverables and Documents (defined below), each Party agrees that it shall make no statements, publications, press releases, advertisements, literature or public releases regarding or as part of work performed under this agreement without first notifying the other Party and securing its consent, unless otherwise indicated in the respective task authorization. Non-research Deliverables and Documents means "gray literature", i.e. technical reports, fact sheets, raw data, and communication products other than Research Publications. Nothing in this Agreement shall prevent either Party from complying with the requirements of Chapter 119 or Section 1004.22(2), Florida Statutes, regarding the disclosure of public information.

15. AUDIT RIGHTS: The COUNTY reserves the right to audit the records of the UNIVERSITY related to this Agreement at any reasonable time and during normal business hours during the performance of the work included herein and for a period of three

(3) years after final payment under this Agreement. The UNIVERSITY agrees to provide any records necessary to substantiate payment requests to the COUNTY, including audited financial statements, to the extent such records are maintained by the UNIVERSITY in the normal course of business. In the event an audit undertaken pursuant to this section reveals improper, inadvertent, or mistaken payments to the UNIVERSITY, the UNIVERSITY shall remit such payments to the COUNTY. The COUNTY shall retain all legal and equitable rights with respect to recovery of payments.

16. SECURITY REQUIREMENTS: Access to certain COUNTY property is restricted. The UNIVERSITY is subject to Article IX, Chapter 32 of the Miami-Dade County Code (Ordinance No. 02-68). In the event the UNIVERSITY students and/or staff need access to such COUNTY property, the UNIVERSITY agrees to comply with the security ordinance and any other requirements by the COUNTY relating to security which may include background checks, the use of photo identification badges and limited access to COUNTY property. The photo identification badges and associated costs are not reimbursed. Prior to commencing Work at any COUNTY property, the UNIVERSITY shall meet with the Plant Superintendent or other designated personnel to submit required information and discuss security relating to the Project while on the COUNTY property.

Issued identification badges must be worn and displayed on an outermost garment at all times while at a WASD site. The UNIVERSITY will be charged on a per person basis for the issuance of WASD identification badges and background investigations. All UNIVERSITY students and staff must be aware that access to WASD sites is restricted to only those with assigned identification badges. Unescorted access to chemical areas, control areas, electrical generation areas/switching areas and fuel areas will not be allowed unless authorized in advance by WASD Senior Management.

Issued WASD identification badges must be safeguarded by assigned UNIVERSITY student(s) or staff. In the event of a lost or stolen identification badge, the UNIVERSITY student(s) or staff must immediately notify WASD security and pay for a badge replacement fee, which is currently fifteen dollars (\$15.00). Once a UNIVERSITY student or staff member has completed its assigned work or upon termination of this Agreement, the identification badge(s) must be returned to the student's or staff member's immediate WASD Supervisor. The UNIVERSITY students and staff will safeguard against unauthorized distribution or posting of any and all WASD provided infrastructure information to any individual or organization not authorized in advance by WASD. Use of camera photography, video or any recording device is prohibited at all WASD sites.

The UNIVERSITY students and staff shall comply with all WASD vehicle parking regulations.

17. TERMINATION OF AGREEMENT: The Director may terminate this Agreement, in total or in part, without cause or penalty, by ten (10) calendar days' prior written notification or by declining to issue written task authorizations, as provided herein, in which event the COUNTY's sole obligation to the UNIVERSITY shall be payment, in accordance with Section 6, for those units or sections of work previously authorized by the UNIVERSITY in furtherance of this Agreement prior to receipt of notice of termination. Such payment shall be determined on the basis of the hours or percentage of work performed and incurred by the UNIVERSITY up to the time of termination. In the event partial payment has been

made for professional services not performed, the UNIVERSITY shall return such sums to the COUNTY within ten (10) days after receipt of written notice that said sums are due. Upon such termination, the COUNTY may, without penalty or other obligation to the UNIVERSITY, elect to employ other persons to perform the same or similar services. The UNIVERSITY may terminate this Agreement upon thirty (30) days' written notice to the COUNTY if the UNIVERSITY is unable to continue work pursuant to this Agreement or any task authorization issued hereunder, and no other UNIVERSITY employee is available to perform such work.

18. DEFAULT: If the UNIVERSITY fails to comply with the material provisions of this Agreement, the Director may declare the UNIVERSITY in default by ten (10) calendar days' prior written notification, provided that the UNIVERSITY shall have an opportunity to cure such default within such ten (10) day notice period or such extended period as the Parties may agree upon. If the UNIVERSITY does not cure the default within the notice period, then the UNIVERSITY shall only be compensated for any professional services completed and incurred as of the date written notice of default is served. In the event partial payment has been made for incomplete professional services, the UNIVERSITY shall return such sums to the COUNTY within ten (10) calendar days after receipt of written notice that said sums are due. In the event the COUNTY prevails in litigation to enforce or defend the provisions of this or any other Paragraph of this Agreement, the COUNTY shall be compensated by the UNIVERSITY for reasonable attorney's fees and court costs to the extent permitted by Section 768.28, Fla. Stat., and awarded by the presiding court.
19. INDEMNIFICATION AND INSURANCE: Each Party agrees to be (i) fully responsible for its acts of negligence or its employees' acts of negligence when acting within the course and scope of their employment; and (ii) liable for any damages resulting from said negligence. The foregoing shall only be to the extent and within the limitations of Section 768.28, Florida Statutes, subject to the provisions of that statute whereby neither Party shall be held liable to pay a personal injury or property damage claim or judgment by any one person which exceeds the sum of \$200,000, or any claim or judgment, or portions thereof, which, when totaled with all other claims or judgments paid by said Party arising out of the same incident or occurrence, exceeds the sum of \$300,000. Nothing herein shall be construed as making either Party responsible for any liability or claim arising out of the negligent performance or failure of performance of the other Party or as a result of the negligence or failure of performance of any third party. Further, nothing contained herein shall be construed or interpreted as: (i) denying either Party or other state or public entity any remedy or defense available under the laws of the State of Florida; (ii) the consent of either Party to be sued; or (iii) a waiver of sovereign immunity of either Party beyond the waiver described herein and provided in Section 768.28, Fla. Stat.

The UNIVERSITY, a State of Florida agency, will provide proof of general liability insurance coverage under the State of Florida Risk Management Trust Fund, established pursuant to Section 284.30, Fla. Stat., and administered by the State of Florida, Department of Insurance, and will provide workers' compensation insurance as required by statute.

20. ENTIRETY OF AGREEMENT: This writing embodies the entire Agreement and understanding between the Parties hereto, and there are no other agreements and understandings, oral or written, with reference to the subject matter hereof that are not merged herein and superseded hereby.

21. MODIFICATION: No alteration, change, or modification of the terms of this Agreement shall be valid unless made in writing, signed by all Parties hereto, and approved by the COUNTY.

All words used herein in the singular form shall extend to and include the plural. All words used in the plural form shall extend to and include the singular. All words used in any gender shall extend to and include all genders.

22. GOVERNING LAW: This Agreement, regardless of where executed, shall be governed by and construed according to the laws of the State of Florida, and venue for resolution of any dispute shall be in a court of law in Miami-Dade County, Florida.
23. SEVERABILITY: If any clause, provision, subsection or Section of this Agreement which is void or unenforceable under any law, regulation, or as a matter of public policy shall be deemed stricken, and not binding on the UNIVERSITY or the COUNTY, or if ruled invalid by any court of competent jurisdiction, the remaining provisions hereof and this Agreement shall be construed and enforced as if such invalid portion did not exist.
24. BINDING EFFECT: This Agreement shall inure to the benefit of and shall be binding upon the UNIVERSITY and the COUNTY and their respective successors, assigns and legal representatives.
25. HEADINGS: The table of contents and any headings preceding the text of the Sections and subsections of this Agreement shall be solely for convenience of reference and shall not affect its meaning, construction or effect.
26. CONFIDENTIALITY: In accordance with Section 119.071(3)(b), Fla. Stat., building plans, blueprints, schematic drawings, and diagrams, including draft, preliminary, and final formats, which depict the internal layout and structural elements of a building, arena, stadium, water treatment facility, or other structures owned or operated by an agency are exempt from Section 119.07, Fla. Stat., and Section 24(a), Article I of the Florida Constitution. This exemption applies to building plans, blueprints, schematic drawings, and diagrams, including draft, preliminary, and final formats, which depict the internal layout and structural elements of a building, arena, stadium, water treatment facility, or other structure owned or operated by an agency before, on, or after the effective date of this Act. Information made exempt by this Paragraph may be disclosed to another governmental entity with prior approval by the property owner if disclosure is necessary for the receiving entity to perform its duties and responsibilities; to a licensed architect, engineer, or consultant who is performing Work on or related to the building, arena, stadium, water treatment plant, or other structure owned or operated by an agency; or upon a showing of good cause before a court of competent jurisdiction. The entities or persons receiving such information shall maintain the exempt status of the information.
27. APPLICABLE LAWS: Each Party shall comply with all applicable local, state and federal laws, rules and regulations pertaining to this Agreement and the Project.

IN WITNESS WHEREOF, the Parties hereto have caused this instrument to be executed by their respective officials thereunto duly authorized, all as of the day and year written above.

ATTEST:

MIAMI-DADE COUNTY, FLORIDA
BY ITS BOARD OF
COUNTY COMMISSIONERS

By: _____
Deputy Clerk

By: _____
County Mayor

ATTEST:

THE FLORIDA INTERNATIONAL
UNIVERSITY BOARD OF TRUSTEES

By: _____

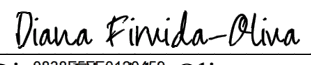
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By: _____
Regnier Jurado, Director
Program Administration, Research

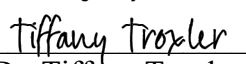
Approved as to legal form
and sufficiency

Approved as to legal form
and sufficiency

Assistant County Attorney

DocuSigned by:

0838F65FC0120459
By: _____
Diana Fivida-Oliva
University Attorney

Read and Acknowledged:

DocuSigned by:

96A7563F5FA8482
By: _____
Dr. Tiffany Troxler

FIU by Design | College of Communication, Architecture + the Arts (CARTA)

FIU By Design is a professional services unit within CARTA. Our mission is to enhance our faculty and students' success by serving as an innovative solution center that provides professional and technical consulting services. Through real-world experimental-learning opportunities, our faculty and expert professionals align our pedagogy with project deliverables for a wide range of clients and organizations. FIU By Design draws expert knowledge from faculty, staff, and members of the community across a variety of disciplines to provide professional services in the following areas:

Design Research and Conceptualization

This area is comprised of:

- Sponsored Design Studios
- Design Charrettes
- Master Planning and Urban Design
- Sustainability and Resiliency Projects

Through the unique lens of architecture, journalism, arts and technology, FIU By Design works with the community to take on challenging projects that engage in sustainable and green building design, particularly important in the tropic and sub-tropic environments. We also tackle urban development and visionary projects that address the impact of climate change.

Sponsored Design Studios are ideal for the integration of engaged scholarship and professional services, necessary elements in solving pressing public concerns. In a carefully planned, semester-long structured design studio, our faculty work with students and appropriate experts to explore design ideas, examine alternatives and provide solutions to our clients' challenges. While addressing the local and broader community needs, faculty align learning objectives with deliverables in projects ranging from small-scale building design to large-scale urban development. Students propose architectural solutions, adaptation strategies and visualization tools to support policy and decision-making, while raising the public's awareness of crucial issues.

FIU By Design also provides services for organizing and facilitating intensive charrette sessions. These meetings bring together a project's various stakeholders to contribute ideas and provide feedback in a collaborative forum. The charrettes are conducted in one to three days or longer, depending on the scope of the project and the requested deliverables.

Public Relations and Organizational Development

This area is comprised of:

- Professional Development and Training
- Community Engagement
- Leadership Workshops
- Speech Coaching

FIU By Design conducts a range of educational, coaching, training and outreach projects. These include formal training sessions, seminars and communication workshops in a broad range of areas. In addition, the Bold Agency at the School of Communication + Journalism offers a variety of services for clients looking to expand their brand, craft social media, create communication strategies and produce creative advertising. The student-run, faculty-supervised agency also conducts market research and guides clients through crisis planning.

Shahin Vassigh, College of Communications, Architecture and the Arts, Florida International University,
shahin.vassigh@fiu.edu, (Phone) 305-348-3032

FIU College of Engineering and Computing

FIU College of Engineering and Computing carries out environmental engineering research that contributes significantly to the advancement of the Miami-Dade Water and Sewer Department (WASD). Environmental engineering programs in the Department of Civil and Environmental Engineering offer the B.S., M.S., and Ph.D. degrees. Our major thrust is to train the next generation leaders in designing resilient and sustainable water and wastewater treatment and reuse, pump station retrofitting, and reduce water leaking and storm water inflow and infiltration. The department has wet chemistry, water, wastewater, fluid, and water resource laboratories as well as energy efficiency and asset management. Research projects supported from the National Science Foundation, EPA, and NIH have been carried out on water quality analysis, disinfection by-products, advanced oxidation processes, aerobic and anaerobic treatment of wastewater, membrane technologies, hydraulic analyses, water conservation, and energy efficiency (solar systems, cogeneration and trigeneration systems). Pilot or full-scale studies can be carried out on the 44 acres FIU engineering campus which includes state of the art facilities, including Applied Research Center (ARC), Wall of Wind (WoW), corrosion labs, system modeling and modeling and visualization for evaluating performance of water and wastewater network and effluent outfalls as well as effects of extreme events (e.g., hurricanes, flooding, sea level rise). In addition, the FIU GIS laboratory has inventory of most Miami-Dade infrastructure maps and database which could be utilized for green infrastructure projects which can be implemented by the WASD.

Past projects include 1) water conservation, 2) biogas quality, 3) solids concentration, 4) performance of clarifier and thickeners, 5) energy efficiency and cogen/trigen facilities, 6) membrane systems and membrane bioreactors, 7) nutrient analyses and struvite formation, 8) solar assisted drying beds and composting systems, 9) integrated and interconnected systems; 10) system reliability, 11) resilient operation and design, 12) renewable materials, 13) prevention strategies for improving wastewater effluent quality, 14) green retrofitting and remediation, 15) optimization by modeling, 16) life cycle analyses and asset management.

Research projects include the COD diversion from primary settler to anaerobic digester, anaerobic oxidation of ammonium (Anammox), co-digestion of Fat-Oil-Grease and food wastes with sludge, and design of water resource recovery facility (WRRF) by using UV disinfection for water reuse. In addition, UV disinfection sensitivity indexes of virus, bacteria, spores, and protozoa have been developed which are very important for the WASD switch from chlorination to UV disinfection.

Proposed projects to assist the Miami-Dade WASD to address the major challenges such as reuse target of 60% by 2025, reduce sewer overflow, end ocean outflow, reduce energy demand and material costs, develop specific technical benchmarks to retrofit three WWTPs to achieve energy positive state, and assess alternatives for water supply and efficiency. Some examples include: 1) energy and material benchmarks for WRRF design using Anammox and MBBR, 2) energy auditing and retrofitting strategies of WWTPs, 3) life cycle cost and benefit of UV disinfection to replace chlorination, 4) treatment strategies to reduce wastewater toxic and COD loading (including leachate), 5) enhanced biogas production enhanced by thermal hydrolysis of the diverted COD, 6) electrochemical coagulation for diverting COD from primary settler to anaerobic digester, 7) wireless and sensor applications to reduce water leakage and infiltration and inflow, 8) water conservation analyses, 9) intensification of system efficiency (e.g., biogas productions, solids concentration), 10) effect of sea level rise on system hydraulics, 11) improving efficiency of solids handling by energy efficient systems, 12) full scale and lab scale testing of system units and performance, 13) minimizing corrosion by operational modifications, 14) workshops for training and dissemination.

Contacts: Berrin Tansel, tanselb@fiu.edu, 305-348-2928, and Walter Tang, tangz@fiu.edu, 305-348- 3046; Department of Civil and Environmental Engineering, Florida International University

FIU School of Computing and Information Sciences

FIU's School of Computing and Information Sciences (SCIS) is a rapidly growing program of excellence at FIU. The School has 29 tenure-track faculty members and over 2,000 students, including over 90 Ph.D. students. The School is engaged in on-going and exciting new and expanding programs for research, education, and outreach. The School offers B.S., M.S., and Ph.D. degrees in Computer Science, and M.S. degrees in Telecommunications and Networking, Cyber-security, and Information Technology as well as B.S./B.A. degrees in Information Technology. NSF ranks FIU 39th nationwide in externally-funded research expenditures. Our Distributed Multimedia Information System Laboratory is leading cutting-edge research on multimedia big data, data science, and disaster information management. The majority of our data collection and analysis tasks are supported by a platform comprised of:

- 1 GPU server: 4x NVIDIA Tesla P100 16GB Passive GPU; 2x Intel Xeon E5-2690 2.6 GHz
- 56 CPU servers: ~1350 CPU cores running ≥ 2.5 GHz; 15 TB of RAM; Solid state disk storage

These resources can easily be used to build a cloud-computing platform and provide services and applications through a Platform as a Service model (PaaS), capable of handling the collection and processing of heterogeneous data from diverse sources. Technologies are used in our projects, such as:

- Databases: PostgreSQL, MySQL, NoSQL
- Programming languages: Java, R, Matlab, C/C++, Python, Objective-C, Shell
- Big Data framework: Hadoop MapReduce, Spark
- Visualizations: Unity 3D, Integrated Computer Augmented Virtual Environment (I-CAVE)
- Specifically, for data mining projects, we applied:
 - o Statistical analysis: t-test, Analysis of variance (ANOVA), Cox-Stuart and Mann-Kendall Trend Test, Structural Equation Modeling (SEM).
 - o Feature analysis: Random Forest, Decision Tree, Deep Learning, etc.
 - o Classification tasks: Convolutional Neural Networks, Support Vector Machine, Neural Network, Hidden Markov Model, Gaussian Mixture Model, Decision Tree, Random Forest, Ensembles, etc.
- Other: Association rule mining, Sequential pattern analysis, and Temporal pattern analysis.

Our projects include but are not limited to, Data Science, Multimedia Big Data, Disaster Information Management, Distributed Multimedia Database Systems, and Deep Learning:

- Multimedia Big Data Management: Video Indexing and Mining, Multimedia database and retrieval
- Collaboration with FIU InWE for NSF CREST Center for Aquatic Chemistry and the Environment: Data analysis on mercury concentration in the Everglades, Gene expression analysis, etc.
- Multimedia-Aided Disaster Information System: an iPad Application implemented for assisting the decision-making process of the officials at Miami-Dade Emergency Operation Center (EOC).
- Storm Surge Simulator: visualize the impacts of storm surge and sea level rise in 2D/3D.
- Citywide Internet of Things (IoT) platform: serves to alert the Miami-Dade County (MDC) officials in case of water pipeline damage.
- Business Continuity Information Network and FIU Disaster Response Tracker: web-based tools that are used by MDC Emergency Management's Business Recovery Program (ESF-18).
- Florida Public Hurricane Loss Model (FPHLM): estimates loss costs and probable maximum loss levels from hurricane events for personal and commercial residential properties.

Shu-Ching Chen, School of Computing and Information Sciences, Florida International University, chens@cs.fiu.edu, (Phone) 305-348-3480, <https://users.cs.fiu.edu/~chens>

FIU Extreme Events Institute

FIU Extreme Events Institute (EEI), currently comprised of the International Hurricane Research Center and the Disaster Resilience and Climate in the Americas program, has become a globally involved center for research, education, and training in natural hazards and disaster risk management. EEI conducts multi-disciplinary research on hazards and vulnerabilities of all types, with emphasis on the role of pre-impact "risk drivers." The Institute includes faculty and researchers from the social and behavioral sciences, engineering, computer science, earth and atmospheric sciences, public health, public administration, business, and architecture. Recently EEI was designated as an FIU Preeminent Program, which is defined as a collaborative endeavor that demonstrates extraordinary success in providing unique learning opportunities, pioneering research and engagement while also expanding FIU's financial base and contributing to FIU's *BeyondPossible2020* strategic plan.

A specific component of EEI's research program focuses on (hurricane- driven) storm surge, large waves, and freshwater flooding, which are the major causes of human and property losses from tropical storms. EEI researchers have developed the Coastal and Estuarine Storm Tide (CEST) and the Fully Adaptive Storm Tide (FAST) models for simulating storm surge flooding, which are part of FIU's ongoing research partnership with NOAA's National Hurricane Center (NHC) and other federal agencies both domestically and internationally, including a proof of concept project with the NHC on combined storm surge and alert-warning-evacuation planning in Haiti and the Dominican Republic. EEI's storm surge team is also currently partnering with the Florida Division of Emergency Management to develop an integrated storm tide and freshwater flood model for coastal urban areas by leveraging the existing storm surge models, including CEST and FAST, originally developed at the IHRC. Urban flood inundation due to both storm surge and rainfall is particularly challenging to model because of a multitude of geometrically complex and small-scale features, including drainage and canal networks, preferential flow paths between buildings, and terrain dependent resistance to overland flow. Maximum inundation depths and maximum (depth-averaged) flow velocities are the most important factors in determining the impact of freshwater and storm surge flooding on built structures.

EEI has an on-going relationship with the Museum of Discovery and Science (MODS) in Fort Lauderdale, Florida, which has included an FIU-IHRC Wall of Wind exhibit, a Hurricane Andrew 25th Anniversary exhibit and Eye of the Storm, and an annual hurricane science, mitigation and preparedness event for the community (free of charge). Past museum relationships and exhibits have included the National Building Museum (Washington D.C.) and the Frost Science Museum. In addition, EEI has an active K-12 STEM program with local South Florida high schools including the *WOW Challenge!* in which South Florida high school student teams develop and test hurricane mitigation concepts, *Engineers on Wheels* where laboratory learning modules are brought to elementary school science programs, and other learning modules for summer programs. These programs can be further developed with a focus on WASD initiatives.

Contact: Rich Olson, Extreme Events Institute, Florida International University, olsonr@fiu.edu, (Phone) 305-348-6398

FIU Southeast Environmental Research Center (SERC) in the Institute of Environment (IoE)

As one of the flagship units in IoE, SERC is a multidisciplinary center devoted to environmental research efforts in the Southeastern United States and the neotropics. SERC was founded in 1993 in response to a growing regional need for scientific investigations in threatened environments of South Florida. Research programs developed in Biscayne National Park, Big Cypress National Preserve, Everglades National Park, Florida Bay, the Florida Keys and the Florida Keys National Marine Sanctuary have been instrumental in providing a basis for management decisions for sustaining these fragile resources in specific areas of water quality, biogeochemistry, ecological modeling, hydrology and contaminant transport. Within SERC is the SERC Water Quality Monitoring Network. The function of the Network is to address regional water quality concerns that exist outside the boundaries of individual political entities. Funding for the Network has come from many different sources with individual programs being added as funding became available. The advantages of having this Network operated from the same facility include site continuity, consistency in analytic methodology, and ease of data integration. The product is a quasi-synoptic "big picture" as to what is happening in the South Florida coastal waters. Although traditional water quality parameters are common used in the network it has been constantly expanded to include human-derived wastewater tracers (caffeine, antibiotics) and indicators (Splenda) and other specialized target compounds (endocrine disruptor chemicals).

Other related activities include the Center for Aquatic Chemistry and Ecotoxicology (CACHÉ) and Water Security at FIU (UNESCO Water Chair). CACHÉ was developed in support of the NSF-CREST and NSF-LTER programs. The CACHÉ analytical facility is an environmental laboratory core offering many services such as nutrient analysis, trace metal analysis, Mercury speciation, analysis of emergent contaminants, water tracers, inorganic bulk parameters, regulated organic chemicals and ecotoxicology studies for multiple environmental matrices. The CACHÉ core center also offers training and talent development for students, and professionals interested in the analysis of water and wastewaters. FIU is establishing the Water Security project, which will permit FIU and its associates to make a difference as it relates to building capacity, sharing knowledge and strengthening links between universities/other higher education institutions, government agencies, and development bodies within the US and in partner countries. Also, the project will serve as a laboratory of ideas, helping reinforce the global security and sustainability agenda, fostering alliances, intellectual cooperation, and operational partnerships, as well as providing advice for policy development and implementation, and strengthening individual and institutional capacities. The target beneficiaries will be water-professionals, but special tailor-made capacity building modules will be put together for policy and decision –makers.

The Institute of Environment represents one of the largest collections of faculty and students associated with water and environmental science in the United States. Increased concern over the preservation of Florida's natural areas and resources has created a critical need for accurate, unbiased scientific information for those who must make decisions affecting the sustainability of these fragile resources. This Preeminent Program includes the Southeast Environmental Research Center, the Marine Education and Research Initiative and the Medina Aquarius Program, the Florida Coastal Everglades Long Term Ecological Research Program, plus an NSF-funded Center of Excellence on Aquatic Chemistry and Ecotoxicology. It also includes the Sea Level Solutions Center, bringing together faculty from nearly every college and school at FIU to address challenges posed by rising seas, the Sustainable Built Environment and Informatics, International Water Group and Socio- ecological Systems.

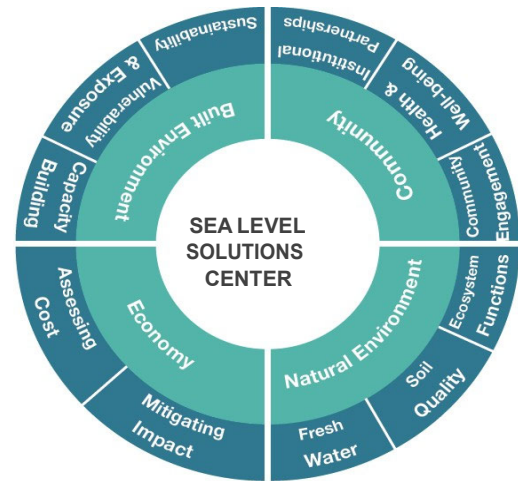
Contact: Piero Gardinali, gardinal@fiu.edu, 305-348-6354, SERC, and Todd Crawl, tcrawl@fiu.edu; 305-348- 3095, Institute of Environment, Florida International University

FIU Sea Level Solutions Center (SLSC) in the Institute of Environment (IoE)

The Sea Level Solutions Center applies information to build knowledge, design and evaluate mitigation and adaptation strategies, and create resilient, prosperous coastal urban communities. The vision of the Sea Level Solutions Center (SLSC) is: 1) to realize innovative, equitable solutions for social, environmental and economic prosperity and engage communities to become resilient to the impacts associated with sea-level rise and climate change, 2) to forge interdisciplinary teams to develop cross-cutting decision support and guide solutions to the impacts of sea level rise and actions that benefit society locally, regionally and internationally, and 3) to play an integral role in guiding and adapting the South Florida community to be economically-viable, equitable, healthy and sustainable. The SLSC advances its mission through multidisciplinary, university-wide collaborations

and partnerships with academic institutions in the Florida Climate Institute, with counties and municipalities through the Southeast Florida Regional Climate Compact, and with management agencies, businesses and industrial partners.

The SLSC develops mechanisms that facilitate education and communication of climate change science, by supporting government and industry frameworks for timely responses, conducting research to establish a sound basis for adaptation and resource management plans, informing decisions and actions, and evaluating the implementation of long-term mitigation strategies.



We achieve our mission through interdisciplinary work streams in a focused coastal urban resilience program with outcomes in the public and private sector areas of (1) *economy*, (2) *natural environment*, (3) *community*, and (4) *built environment*. This formulaic approach integrates environment, social and infrastructure data to create knowledge that advances sea level solutions in collaborations across FIU units including natural sciences, engineering, computer sciences, architecture, economics, policy and law, and external partners.

Active interdisciplinary research programs of the SLSC include the NSF-funded projects Urban Resilience to Extremes and Urban Water Innovation Sustainability Research Networks (UREx SRN & UWIN). UREx integrates scholars with city and community practitioners to produce the social-ecological-technological approach to apply resilient infrastructure data, models, images, maps, stories, risk scenarios and on-the-ground projects in 10 cities to accelerate innovative urban sustainability and resilience knowledge and application. UWIN creates technological, institutional, and management solutions to help communities increase the resilience of their water systems and enhance preparedness for responding to water crises. New projects include real-time sensing of urban flooding for government and resident decision-making in local municipalities. Other key activities include the SLSC interdisciplinary research and design studio where faculty and students co-develop science-based design solutions, relevant adaptation strategies and data-driven performance outcomes and our urban flooding citizen science program to develop a robust database of on-the-ground measurement data that engages the public.

Contact: Tiffany Troxler, troxkert@fiu.edu, 305-348-1571, Sea Level Solutions Center, Florida International University