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We welcome articles, letters, suggestions and information regarding workshops and other educational opportunities for economic development professionals. Please forward your submissions by email to our Editors (addresses below).

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# Chattahoochee River Park: Riding the Rapids to Revitalization

by Helena Coates, Media, Marketing & More, Inc.

*What started out as one man’s unique vision of making the Chattahoochee River a sustainable force in economic development for the Columbus, GA community became a reality over a decade later. Mr. John Turner, W.C. Bradley Co. executive and community advocate, led the charge to achieve what most thought was impossible.*

This economic development project did not just achieve its original goals of reenergizing the Chattahoochee River; this project reenergized an entire community and offered untold rewards for its impact locally. Relying on the natural fall line of the Chattahoochee River, two dams were breached and additional construction in the river allowed the rapids to take shape. In May of 2013, the Chattahoochee River Park — the world’s longest urban white-

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*(continued on page 3)*



Kayakers entering CutBait.

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## FROM THE EDITOR

*"Make no little plans; they have no magic to stir men's blood and probably will themselves not be realized. Make big plans; aim high in hope and work, remembering that a noble, logical diagram once recorded will not die."*

— Daniel H. Burnham



I submit to you that the time for making big plans is NOW.

Truly, these are exciting times for those of us in the planning profession — specifically those of us involved in economic development within our cities and communities, all across the nation. The opportunities have never

been so great to make a positive impact in our economies because nearly every city and township in our nation has been affected by the across-the-board economic downturns over the last several years.

With our professional focus on Economic Development planning, coupled with our collective 20/20 vision gained in hindsight, I know many of you are able to contribute valuable, practical and well-reasoned solutions that will be of great value to your colleagues.

As the editor of *News & Views* for the coming year, it is my greatest hope that we will be a vibrant community of contributors, working to solve the big questions that will enable us to make big plans. Let's contribute to each other by throwing out your big ideas and sharing them among professionals who are equipped to vet those big ideas and shape them into truly impactful solutions that will allow us to achieve economic vibrancy in each of our respective homes, towns, cities, counties, states, regions across our nation and beyond.

John Provo and your leadership team for the Economic Development Division of the American Planning Association are committed to making this newsletter a valuable resource for you, our colleagues in the field, as well as in the classroom.

Thank you in advance for your participation in our quest to make solid contributions to the field of planning for economic development. Your input is invaluable to the healthy and vibrant exchange I want to foster among us. Please don't hesitate to send me an idea — the bigger, the better! I look forward to taking this journey with you. ■

— Verona Campbell, MCP

## THOUGHTS FROM THE CHAIR



Welcome to another edition of *News & Views* from your Economic Development Division. I am very grateful for the work that Verona Campbell, Julie Herlands, Jeff Mills and others have put into producing this newsletter.

In addition to this newsletter we also bring you periodic webinars for those all-important CE credits, keep a vigorous social media forum running on LinkedIn and Twitter, assist members with research resources and technical assistance with presentations for state chapter conferences, run national competitions for communities and students, and develop several sessions for the national planning conference.

All of this relies on volunteers. For example, Secretary-Treasurer Andy Struckhoff and I just finished working closely with Bob Parker and Terry Moore from Oregon, and George Rolfe from Washington for submissions to this year's national conference which will be in Seattle in April, 2015.

### So what are you going to do?

- Our Social Media Coordinator Jason Ray has led us up to 2,137 followers on Twitter @APA-EDD and 1,714 members of our LinkedIn group. If you're not a part of the conversation in those forums why not give them a try?
- If you have ideas for stories for *News & Views* please contact Verona Campbell at [vcampbell@columbusga.org](mailto:vcampbell@columbusga.org). She wants to hear from you!
- Watch your inbox for announcements for our Donald Hunter (community plans) and Terry Holzheimer (planning student) competitions this fall.
- If you have webinar ideas, need state conference help, or really have anything else you think we can do together, contact me at [jprovo@vt.edu](mailto:jprovo@vt.edu).

Lastly I just wanted to share something brought to my attention by Robyn Eason, our volunteer membership coordinator. National APA has piloted a new platform for profiles that includes a lot of new features that will bring you virtual presence at APA into the 21st Century. Take a look at: [www.planning.org/myapa/profile](http://www.planning.org/myapa/profile). ■

Thanks!

John Provo

CHATTAHOOCHEE RIVER, CONT. FROM P. 1



Artist rendering of the 14th Street Pedestrian Bridge.

water course at over 2.5 miles — was open to the public with thunderous support.

Columbus’s founders knew the economic value of situating the city on the riverside and their foresight helped establish Columbus as a booming center for the cotton and textile trade industry. As markets evolved, the mills were closed, but community leaders saw the opportunities the Chattahoochee River held. After the 1996 Olympics, leaders met with internationally known whitewater designer Rick McLaughlin to discuss the possibilities of creating a whitewater course in the heart of the city. Initial meetings and drawings rendered proved its viability and so the work began.



The planning and economic development principles used for this project were not new, however the diverse and intense public involvement, collaboration and financial investment by many entities made this project a reality. The Chattahoochee River Park was funded through a public/private initiative and reached across state lines where both Alabama and Georgia meet on the east and west respectively. The project’s \$26 million investment was paid through the collaborative efforts of individuals, businesses and foundations as well as local, state (Georgia and Alabama) and federal government.

The Chattahoochee River Park benefits the entire region by increasing revenue, restoring the river to its natural state, creating jobs, growing tourism and improving the quality of life by creating a unique sense of place. The over 2.5 miles features 10 class II-class IV rapids and offers outdoor activity opportunities in rafting, kayaking, paddle boarding, river surfing, fishing and other activities.

Project leaders enlisted the help of Columbus State University to prepare an economic impact study. And the results were encouraging. When the park reaches its full potential, experts project over 188,000 visitors, creating a \$44 million economic impact. (See Table 1 for a breakdown of the visiting persons by market and source.)

Table 1  
Chattahoochee River Watershed Utilization

Participant Level	Market		Source	
	Local	Out-of-town	Events	Regular Use
188,400	44,400	144,000	8,000	180,400

The out-of-town patrons of the whitewater venue were identified as either persons who would be staying overnight in local hotels/motels, staying with friends/family or as single day visitors. (See Table 2 for more detail.)

*(continued on page 4)*



Kayakers and rafters play in WaveShaper.

CHATTAHOOCHEE RIVER, CONT. FROM P. 3

Table 2  
Distribution of Out-of-town Whitewater Visitors

Staying in Local Facilities	Staying with family/friends	Day Visitors
122,157	10,158	11,685

The economic impact of Whitewater Columbus, GA also translates into additional employment opportunities in the local economy. This project is expected to support 739 jobs in the community. (See Table 3 for a breakout of these employment positions.)

Table 3  
Jobs Supported by the Whitewater Venue

Employment Category	Number of Jobs (188,400 participants)
Accommodations	143
Food/Drink	188
Entertainment	105
Retail	83
Transportation	28
Miscellaneous	7
Whitewater Operations	185
<b>TOTAL</b>	<b>739</b>



Mat Swift, John Turner and Richard Bishop celebrating the grand opening of Whitewater, Columbus, GA.



Kayaker plays in Chattahoochee.



Crowd gathers for the grand opening of Whitewater, Columbus GA in May 2013.

(continued on page 5)

CHATTAHOOCHEE RIVER, CONT. FROM P. 4



Kayakers and rafters shoot the rapids of the Chattahoochee.

During construction, whitewater project engineers created a waveshaper for paddlers, surfers and rafters to play in and a habitat pool for fish and wildlife returning to the area. Rafters also find themselves surrounded by stunning scenery from the first paddle stroke all the way to the last — and very well-known — rapid, Cutbait. They enjoy a historic mill converted into modern-day lofts, the high-tech headquarters of a Fortune 500 company and the flora and fauna flanking the banks of the Chattahoochee River.

Now, just one year since its opening, over 16,000 rafters have experienced whitewater in the heart of Uptown Columbus, Georgia. *USA Today* has named it “one of the top 12 greatest man-made adventures on the planet.” The Atlanta-Journal Constitution called White-water Columbus, GA “the best of the Southeast.” And the accolades continue to build.

City and community leaders are proud of what was achieved in this decade-long endeavor and the Columbus community will glean economic benefits well in to the foreseeable future. ■

### Useful Calendars

American Planning Association

[www.planning.org/calendar](http://www.planning.org/calendar)

International Economic Development Council

[www.iedconline.org/?p=Conferences](http://www.iedconline.org/?p=Conferences)

Lincoln Institute of Land Policy

[www.lincolnst.edu/news-events/calendar](http://www.lincolnst.edu/news-events/calendar)

National Association for Business Economics

[www.nabe.com/calendar](http://www.nabe.com/calendar)

Urban Land Institute

[www.uli.org/Events.aspx](http://www.uli.org/Events.aspx)

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## APA Community Planning Assistance Teams

The Community Planning Assistance Team (CPAT) initiative is an AICP component of a broader APA Community Assistance Program.

By pairing a multidisciplinary team of expert planning professionals from around the country with community members, key stakeholders, and relevant decision makers, the place-based initiative seeks to foster community education, engagement, and empowerment.

Each team is selected for the specific expertise needed on the project to offer pro bono assistance in developing a framework or vision plan that promotes a sustainable, livable, economically vibrant, and healthy community.

Communities facing a range of challenges including, but not limited to, social equity and affordability, economic development, sustainability, consensus building, and urban design are well-suited for assistance through the program. Projects focus on localities with a demonstrated need for assistance, where planning resources and expertise may not otherwise be available. Learn more at [www.planning.org/communityassistance/teams](http://www.planning.org/communityassistance/teams).

# Economic Development Division's Annual Business Meeting & Reception

Ferris wheel in Centennial Park:  
[www.skyviewatlanta.com/#about](http://www.skyviewatlanta.com/#about)



*Julie Herlands, AICP, Chair of the Economic Development Division, presents the Hunter Award to Richard Bishop, President of Uptown Columbus, Inc. (above) and the Honorable Mention to Engineer Zaidan Mohammed Yousef, General Manager for the Royal Commission at Yanbu's Division of Strategic Planning and Investment Development (below).*

Nearly 30 members and friends of the Division met on April 28, 2014, for the Economic Development Division's Annual Business Meeting and Reception. Awards and recognitions were presented along with the opportunity for members to network, see old friends, and make new ones. Long-time mentor, past Chair of the Division, and Chair of the APA Divisions  
*(cont'd on page 7)*



*(L-R) Doris Bishop, (wife of) Richard Bishop, President and CEO of Uptown Columbus, William Anderson, President of APA, and Verona Campbell, Columbus-Phenix City MPO.*

EDD ANNUAL MEETING, CONT. FROM P. 6



Council, Terry Holzheimer, was remembered by colleagues and friends. The winner and runner-up of the 2014 Donald Hunter Excellence in Economic Development Planning Award were recognized, and our Student Scholarship Award was presented (see separate stories in this issue). This evening is always a highlight of the APA Annual Meeting for Division members, and the 2014 gathering was no exception. We hope you will join us next year in Seattle!

Upper left: Chair-Elect John Provo, AICP, presents the Economic Development Division Travel Scholarship to Carolyn Fryberger, 2014 MCRP, University of North Carolina Chapel Hill.



Lower left: Bob Lewis, AICP, long-time leader of the Division, networks with Andy Struckhoff, AICP, incoming Secretary/Treasurer of the Division.



Above: Hunter Award Honorable Mention Recipient Engineer Zaidan Mohammed Yousef, General Manager for the Royal Commission at Yanbu's Division of Strategic Planning and Investment Development, with APA President William Anderson, FAICP.



Left: Mark Lundgren, AICP, 2013-14 EDD Conference Chair, and John Provo, AICP, EDD Chair-Elect, present a plaque to outgoing Chair, Julie Herlands, AICP.

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# A City on the Red Sea Builds on Its Assets

by Ryan Hughes, Yanbu Al-Sinaiyah, Kingdom of Saudi Arabia



Royal Commission at Yanbu 2014 Flower Festival. Guinness book of world record holder for the largest flower carpet.

## Royal Commission at Yanbu, Kingdom of Saudi Arabia, for “Yanbu Economic Vision 2030”

**I**n May, 2013 the city of Yanbu Al-Sinaiyah in the Kingdom of Saudi Arabia adopted its Yanbu Economic Vision 2030. A first of its kind for the new city located on the Red Sea, ‘The Yanbu Economic Vision 2030’ is a robust and visionary document that will have an immense economic impact on the future of the city and its people. The plan aims to enhance job growth by 31%, creating up to 33,000 new jobs beyond the city’s projected 63,000+ jobs by 2030. By touching every aspect of commercial and industrial activity in the community, its approach is holistic and driven by a comprehensive vision for economic diversity, job growth, proactive city management, improved quality of life and community attractiveness.

### A Spring by the Sea

Deriving its name from the nearby city of Yanbu Al-Bahar (Arabic meaning ‘Spring by the Sea’), Yanbu Al-Sinaiyah (Yanbu Industrial City) traces its founding to 1975 by His Majesty the King of Saudi Arabia. In its 40-year history, Yanbu has been transformed from a strip of undeveloped coastal desert land on the Red Sea into a new, state-of-the-art, world class industrial city.

The mission of the Royal Commission at Yanbu is, and has been, primarily focused on supporting development of the Saudi Arabia’s primary industries and in particular petrochemicals. As such, the city has per-

formed as the major strategic hub for industrial development in western Saudi Arabia. It’s also the largest port exporting crude oil on the Red Sea coast. Now having achieved its original mission, the city has in the past two years begun expanding its industrial zone by an

## Honorable Mention 2014 Donald E. Hunter Excellence in Economic Development Planning Award

(continued on page 9)

YANBU, CONT. FROM P. 8



*Above: Map of Yanbu, Kingdom of Saudi Arabia; Upper Right: Royal Commission at Yanbu 2014 Flower Festival. Local and regional dignitaries ceremonial opening this year's flower festival; Lower Right: Yanbu Al-Sinaiyah. Bird's eye view facing west toward the Red Sea.*



additional 420 square kilometers (162 square miles) to accommodate expected growth.

The demographics of the country have further intensified the need for economic development and diversification. With a fast growing national population of over 28 million — half of which under the age of 25 — the need for additional job growth is immense. The city is positioned as a key player in creating and bringing new employment opportunities for young Saudi citizens. It takes advantage of community assets including local universities and technical schools. The strategic design of The Yanbu Economic Vision 2030 outlines projects and specific strategies to stimulate job growth through diversification of the local economy. It identifies recruitment strategies to stimulate downstream industries and local sourcing as well as established manufacturing. All the while, The plan advocates for the highest quality of life in the Middle East and especially for the city's 122,000 residents. It also accommodates a growing visitor base along the new waterfront development.

### **A New Economic Vision**

Stemming from an overall desire to diversify the local and regional economy and to provide meaningful and highly skilled employment for future generations,

the Economic Vision 2030 for Yanbu is the most comprehensive city economic development tool adopted to-date. The plan introduces a new vision which focuses on diversifying the city's and regional economy. Several initiatives build upon the city's unique location on the world's primary shipping route along on the Red Sea through the Suez Canal.

The plan is not only unique to the city, but also to the Kingdom of Saudi Arabia. His Highness, the Chairman of Royal Commission for Jubail and Yanbu, described The Yanbu Economic Vision 2030 as not only a city economic development plan, but a plan for the entire country. His comment is indicative of Yanbu plan's the importance, value and breadth believing it has the potential to be a model for the other cities in Saudi Arabia. Yanbu's sister city in eastern Saudi Arabia, Jubail, has stated it wishes to prepare a comparable plan. His Highness also intends to present the Yanbu Economic Vision 2030 to the national Ministry of Planning and of Commerce.

Nineteen interconnected components establish the plan's vision and elaborate on the details of implemen-

*(continued on page 10)*

YANBU, CONT. FROM P. 9

tation. Industrial initiatives build on the city’s well-established petrochemical industrial base. They include a comprehensive hub for multi-modal logistics, a minerals processing hub, the nation’s first automotive cluster and value added ‘downstream’ products from the petrochemicals industry.

Major community projects focus on workforce advancement, health and wellness facilities and investments that enhance the quality of life of residents. The plan gives the city’s management leadership a menu of strategic programs including steps for organizational transformation, enhancing competitiveness, major branding and marketing initiatives, as well as major commitments to green practices and environmental management.

**From Planning to Reality**

The Yanbu Economic Vision 2030 was prepared with the assistance of SRI International’s Washington D.C. economic development team consisting of several economic specialists and organized in a professional and graphically appealing fashion. The 550 page document contains extensive graphs, market data, charts, and images communicate comfortably its concepts and ideas. The Economic Vision 2030’s content is both

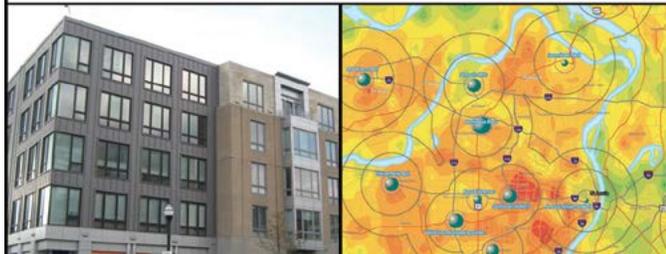
*(continued on page 11)*



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Top to bottom: Yanbu Al-Sinaiyah – Visitors from the Mercedes company; Royal Commission at Yanbu Flower Festival; Yanbu Al-Sinaiyah. Waterfront Investors Tour.

YANBU, CONT. FROM P. 10

relevant, contextual, and visionary as it introduces ideas which have not been previously considered by other cities in the country.

The plan is a complete package; providing a comprehensive background and explaining the initiatives and individual project details as well as their market driven justifications. It's the road map for economic development and the basis for a current city-wide master plan update. As such, the plan embraces a host of new technologies and new ideas; seeking to attract global investors as well as a global workforce. All 43 projects include timelines and key performance indicators which establish metrics of individual project and overall success. A schedule of project tracking is assigned as well as further requirements for plan implementation.

Formally approved by the Royal Commission in May 2013, the plan's implementation officially begun in January of 2014. All four industrial initiatives are already being carried out through in-depth market research and study. Certain projects have been initiated and are gaining momentum and already being expanded upon, such as the Yanbu Auto Cluster. Though still too



early to the results, every indication shows that projects will generally be carried out according to their intended timelines. City leadership is committed to achieving the job growth and revenue goals outlined in the plan. Further in-depth feasibility analysis and new opportunities may give additional direction to the initiatives. ■

### Update Your APA Profile!

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## Remembering Terry Holzheimer

**T**erry Holzheimer, director of economic development for Arlington County for nearly a decade, died on March 1, 2014, of a heart attack. He was 66. His death came six weeks after his wife of 34 years, Mary Benedette Pelletter-Holzheimer, died after a lengthy battle with cancer.

The reaction to his passing was far-reaching. Arlington County Manager Barbara Donnellan said that “Arlington County has lost a dedicated public servant and a leader who worked for decades to build one of our nation’s most successful and stable communities.” Terry’s death will have a major impact in the greater Washington business community, according to the Washington Business Journal. Jim Dinegar, president of the Greater Washington Board of Trade, called Holzheimer “one of the deans in the economic development profession, not just in the region, but nationally.”

Before coming to Arlington in 2005, Terry served as Loudoun County’s director of economic development from 1989 to 1996. His career also includes heading a management consulting firm, Development Advisory Service Inc. that provided services to local governments throughout the country in housing and economic development. Earlier, he worked for the National League of Cities, consulting with city and county governments on redevelopment and rehabilitation programs.

Terry had a Ph.D. from George Mason University in public policy, with a specialization in regional development. He held a B.A. in economics from the University of Florida. He was a member of the American Institute of Certified Planners (AICP) College of Fellows and was certified in economic development by the International Economic Development Council. He also was an adjunct professor and advisor at Virginia Tech and George Mason Universities in urban affairs and planning.

He was committed to educating the next generation of planners and economic developers. A Virginia Tech student, Kate McConnell, captured the collective reaction from students past and present: “As a professor, his classes were entertaining, practical, and relevant. The concepts help me daily in my professional life. He was generous with his time and was always there to talk. What’s so phenomenal about Terry is that my experience is not unique. Countless other students and professionals have similar stories — how he challenged them, provided good counsel and insight, and shaped how they think about planning, economic development, and public service.”

Terry had been a leader in APA and for the Divisions of APA and the Economic Development Division specifically. He served as Chair of the Economic Development Division from 2004-2006, EDD Newsletter Co-Editor most recently from 2012-2014 as well as years’ past, and in various and countless leadership roles with the Division. Terry had been a long advocate for Divisions within APA, in his official capacity as a former Divisions Council Chair as well as spearheading Divisions Council initiatives such as “Airports in the Region” and most recently the “Immigration” track at the 2014 Atlanta Conference. His work for and commitment to the Economic Development Division was unparalleled with Terry often ending up being the “go-to guy” for an unbelievable amount of activities and assignments — from presenting at regional and chapter conferences to writing articles to organizing sessions at the National Conference. His intelligence, energy, and good humor are irreplaceable; his reach was immeasurable; and he will be greatly missed.

To honor Terry’s memory and his dedication to educating planners on integrating economic analysis and economic development into planning as well as his dedication to the Economic Development Division, the Economic Development Division’s student scholarship will be re-named in his honor as the “Holzheimer Memorial Student Scholarship for Economic Development Planning.” It will be available in the 2014-2015 school year to graduate school students in PAB-accredited programs.



# Waste Not, Want Not: Choosing the Most Economically Impactful Configuration of Swine Waste Biogas Systems in Eastern North Carolina

by Carolyn Fryberger, MCRP Candidate 2014, Department of City and Regional Planning, University of North Carolina at Chapel Hill

*Eastern North Carolina is home to the densest industrial hog farming in the world, but from the perspective of renewable energy technologies this may be the equivalent of sitting on a gold mine. This research uses IMPLAN to estimate the economic impact of waste-to-energy system installation on hog farms in compliance with the NC Renewable Energy Portfolio Standards, comparing a centralized and decentralized configuration to maximize the benefit to the North Carolina economy as a whole.*

## Introduction

Eastern North Carolina is home to the densest industrial hog farming activity in the world and by extension the highest concentration of hog waste. This waste is managed through a 'lagoon and spray' system: hog waste is stored in large open lagoons and as the lagoons fill the waste is spread onto fields where the high nitrogen content can be taken up by grasses. This practice places a high toll on neighboring communities which experience reduced environmental quality, negative health impacts and reduced property values due to odors and air and water pollution. These impacts are worsened by flooding which can cause lagoon breaches as was seen in 1999 when Hurricane Floyd hit eastern North Carolina.

From the perspective of renewable energy technologies however, Eastern North Carolina is sitting on a veritable gold mine. Through anaerobic digestion hog waste can be turned into biogas and burned to generate electricity. So-called waste-to-energy or biogas systems offer a solution that mitigates many of the negative impacts of hog waste management while at the same time bringing a new revenue stream to farmers and providing electricity from a non-petroleum source.

A 2013 report by Prasodjo et al., *A Spatial-Economic Optimization Study of Swine Waste-Derived Biogas Infrastructure Design in North Carolina*, analyzed multiple configurations of biogas systems to determine which

system exhibited the lowest cost per kilowatt hour of electricity produced.<sup>1</sup> This research builds on Prasodjo et al's work, asking the question of which of the two least-cost configurations brings the most economic impact to North Carolina? Hog farming is a primary industry in eastern North Carolina, installation of waste-to-energy systems could have a transformative effect in this region bringing new economic activity as well as improved environmental quality.

## Methodology

IMPLAN ("IMpacts for PLANning"), an industry standard input/output analysis software, was used to model economic impacts of the two configurations. The model estimates three types of impacts — direct, indirect and induced — in terms of jobs and economic output from a new economic activity by flowing the new spending through matrices of inter-industry spending relationships. Direct impacts are the jobs and output associated with the activity being modeled, in this case the jobs created in building and running the new biogas capture systems. Indirect impacts result from increased inter-industry spending that results from the modeled activity and induced impacts result from increased household spending resulting from the additional jobs created directly or indirectly by the modeled activity.

## System Configurations

The two least-cost configurations from Prasodjo et al's study were modeled through IMPLAN to determine the economic impacts that would result from these two distinct waste-to-energy system configurations. These configurations are:

## WINNER

### Economic Development Division Graduate Scholarship

(continued on page 14)

WASTE NOT, WANT NOT, CONT. FROM P. 13

- 1. Decentralized Electricity Production:** Biogas is captured on farm using in-ground ambient temperature mixed digesters and lightly conditioned. On farm microturbines are used to convert the conditioned biogas into electricity. Interconnection is required to enable electricity sales back to the grid. This configuration could be implemented in a distributed manner, farm by farm without a high need for coordination.
- 2. Centralized Directed Biogas:** Biogas is captured on farm using in-ground ambient temperature mixed digesters and lightly conditioned. It is transferred via a newly installed low pressure pipeline to a new central hub facility for heavy conditioning and compression; from which point it can be injected into the existing natural gas pipeline and sent to an existing combined cycle natural gas power plant to generate electricity. This configuration would require significant planning and coordination to install pipeline networks and centralized hubs.

**Scope**

Under each configuration it was assumed that implementation would be phased to comply with the three phases of North Carolina’s Renewable Energy Portfolio Standard. Prasodjo et al.’s work identified 127 farms in across 13 counties in eastern North Carolina best suited to participate in each REPS stage based on location and size (Prasodjo, 2013, pg 30). These farms and their associated energy production potential were used to determine costs and revenues at each REPS stage and IMPLAN scenarios were run to reflect the construction and operations activity in the appropriate event years. Table 1 summarizes the parameters for the twelve IMPLAN scenarios.

**Analysis by Parts**

For most industries the IMPLAN model utilizes a standard Social Accounting Matrix that captures the structure of a local economy and industry to industry spending relationships. Through these matrices the model estimates how much activity is stimulated in an industry given a \$1 increase in spending in another industry. When it comes to modeling biogas production however, there is no existent IMPLAN industry. To get to the impacts of this new industry an ‘analysis by parts’ was performed which separates the calculation of direct impacts from the modeling of indirect and induced impacts. Direct impacts were thus calculated through first-hand research of existing biogas systems and used as inputs to determine indirect and induced effects.

To get to the indirect and induced impacts, a new industry to industry spending matrix, or production function, had to be defined for the new industry under each configuration. A production function expresses how much input is required from a given industry to produce a dollar of output in the primary industry, these figures are termed “spending coefficients.” For the two configurations in this analysis, the production functions were created through adapting the existing industry spending pattern of electricity production (IMPLAN sector 31) based on research of existing biogas systems. Spending coefficients associated with fossil fuels and other industries not involved with electricity or biogas production from hog waste were set to zero and these shares were then redistributed to pertinent industries based on research of existing systems.

**Calculation of Inputs**

Cost data and system configurations were based on first-hand research of existing systems and figures provided in the Prasodjo et al.’s report. Potential electricity generation for each farm was calculated based on the number of permitted swine head and equipment was sized and priced based on this capacity. Revenues from electricity sales for each farm were calculated off of the capacity figure as well, and energy was valued at \$103.31/MWh based on data from existing systems.

**RESULTS:  
Impact on Economic Output in North Carolina**

From the perspective of economic output, the decentralized scenario’s

*(continued on page 15)*

Table 1. Summary of IMPLAN Scenario Parameters

	Configuration 1: Decentralized Electricity Production			Configuration 2: Centralized Directed Biogas		
REPS Stage	1	2	3	1	2	3
<b>Construction</b>						
Event Year	2014	2015	2018	2014	2015	2018
# of Farms	39	46	42	39	46	42
# of Hubs	-	-	-	2	4	5
<b>Operations</b>						
Event Year	2015	2016	2019	2015	2016	2019
# of Farms	39	85	127	39	85	127
# of Hubs	-	-	-	2	6	11

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construction phase has the highest one-time impact on the North Carolina economy with \$155.9 million in new economic output in the first REPS stage, building to \$180.1 for the construction of the final REPS stage. Construction of the centralized scenario has a lower impact with \$109.3 million of new economic output in stage one building to \$123.7 million in the second and third phases. Comparing the direct impact to the total impact, construction of the decentralized system has a multiplier of 1.57 versus 1.60 for the centralized system. For every dollar spent on system construction approximately \$1.57 or \$1.60 is spent elsewhere in the economy depending on the chosen configuration.

the new economic output from operations is slightly higher under the centralized configuration with \$13.3 million annually of new output in stage one growing to \$43.3 million by stage three versus \$12.9 million and \$40.2 million annually for the decentralized configuration in stage one and three respectively. Similarly the multiplier for the centralized configuration is 1.34 versus 1.31 for decentralized.

### Impact on Employment in North Carolina

Turning to employment impacts the decentralized configuration appears to be the leading scenario with more jobs supported both during the construction phased and during operations. This make sense as this configuration has more distributed activity, whereas under the centralized configuration there are some efficiency gains as large equipment is located at centralized hubs and shared among farms.

During construction, the decentralized configuration supports 980 full-time equivalent jobs, this impact grows to 1,160 by the third REPS stage. In contrast, the highest employment impact of the centralized configuration is 850 FTE jobs supported during the second REPS stage.

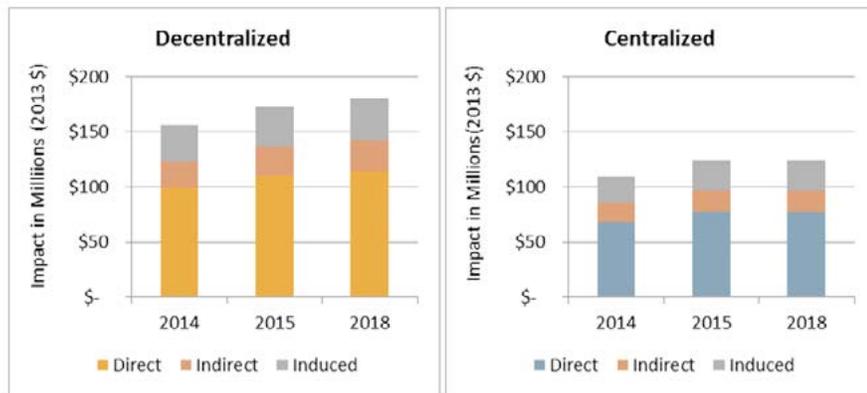
The decentralized configuration has an average employment multiplier of 1.74 during construction, versus 1.66 for the centralized.

The differences are starker during operations. By the third REPS stage the decentralized configuration is supporting a total of 149 FTE jobs annually versus only 77 under the centralized configuration. This translates into an average multiplier of 2.33 for the decentralized scenario — for every person directly hired to manage biogas systems approximately 2 FTE jobs are supported elsewhere in the economy. A multiplier cannot be calculated for the centralized configuration because it has no direct employment impact.

Construction and operations of these systems would also entail new tax revenues for state and local government. The decentralized system leads again here, likely due to the

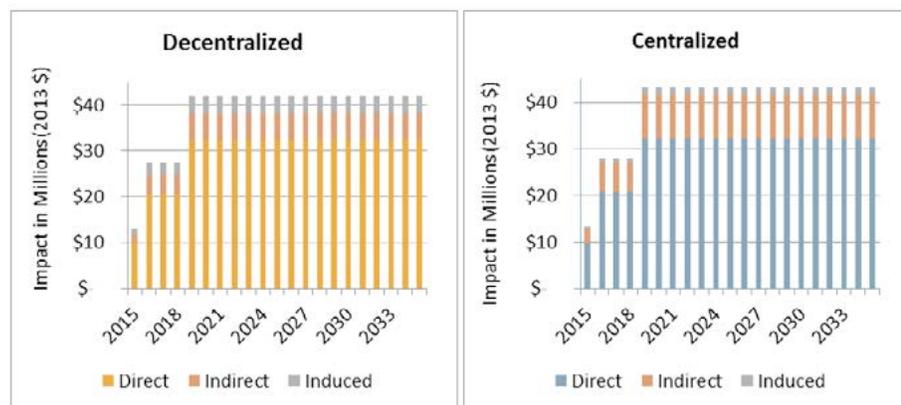
*(continued on page 16)*

Figure 1. Impacts from construction on economic output in North Carolina



The impacts of construction are just a one-time effects. However, these systems are understood to have a useful life of 20 years, so looking at the operations phase there are continued benefits over the time period of 2015 to 2033. As with the construction impacts the magnitude of the effect increases as more systems come online in successive the REPS phases. Comparing between the centralized and decentralized configurations

Figure 2. Impacts from operations on economic output in North Carolina



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Figure 3. Impacts from construction on employment in North Carolina

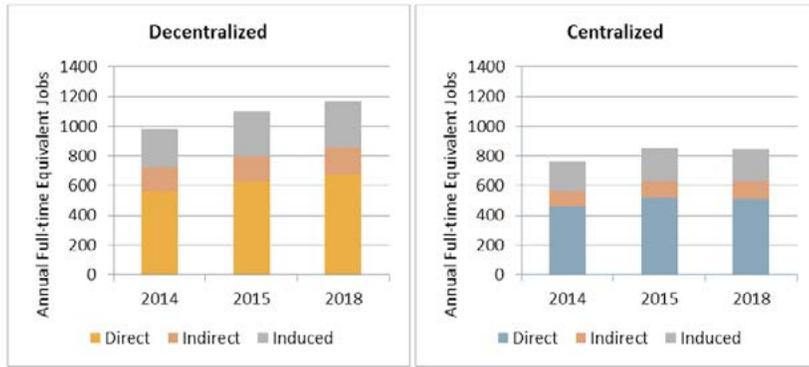
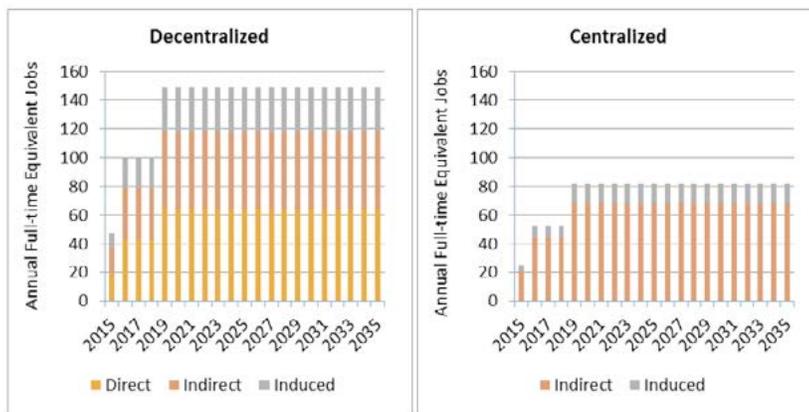


Figure 4. Impacts from operations on employment in North Carolina



greater employment impact this system brings and thus a larger income tax benefit for the state.

For both configurations the biggest impact comes from system construction which for the decentralized configuration is estimated to have a \$22 million tax impact over the three REPS stages versus a \$15 million impact for the centralized system. Once the systems are in operation the annual impacts build with each REPS stage; for the decentralized configuration this impact is \$185,000 annually in stage one (2015) growing to \$575,000 annually by stage three (2019). The centralized configuration brings \$174,000 of new tax revenue annually in stage one and builds to \$551,000 annually by stage three.

**Conclusion**

The IMPLAN analysis gives some insight into which system configuration would bring the most economic impact to the state of North Carolina as a whole, but the results are mixed displaying a classic tradeoff between efficiency and jobs. The decentralized configuration leads in almost all measures except for economic

impact during operations. Much of this is due to the fact that the decentralized configuration is less efficient than the centralized, requiring dispersed construction and operations activity on each farm. This may be a benefit from the standpoint of economic impacts but from the farmer’s perspective it poses a higher cost and does not benefit from the coordination and economies of scale that the centralized configuration brings.

The best solution here may in fact be a blended approach. The decentralized system can be phased in and connected to a central system of pipes later down the road as these systems are proven and become more widely known. Such an approach will allow time for more biogas supporting industries to locate in North Carolina, which will further boost economic benefits to the state by keeping more of the spending and employment locally. Additionally a blended approach gives state and local government the opportunity to see these systems in operation and understand the benefits to their regions, paving the way for the coordination action required for the centralized infrastructure and public support of system construction. 🏠

Table 2. Estimated New State and Local Tax Revenue from Installation and Operation of Biogas Systems Fulfilling the NC REPS Set-asides

	Decentralized	Centralized
Construction ( total for all stages)	\$22 million	\$15 million
Operations - Stage 1 (2015)	\$185K /year	\$174K/year
Operations - Stage 2* (2017)	\$389K/year	\$364K/year
Operations - Stage 3* (2019)	\$575K/year	\$551K/year

\*Stage two and three figures are cumulative

**Footnotes**

<sup>1</sup> Prasadjo, D, Vujic, T, Cooley, D., Yeh, K., & Lee, M. (2013) A Spatial-Economic Optimization Study of Swine-Waste Derived Biogas Infrastructure Design in North Carolina. Durham, NC: Duke University, Duke Carbon Offsets Initiative. [http://nicholasinstitute.duke.edu/sites/default/files/publications/ni\\_r\\_13-02.pdf](http://nicholasinstitute.duke.edu/sites/default/files/publications/ni_r_13-02.pdf).

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