S&E sans Borders
Optimizing EPSCoR Multiagency Funding
For a Transformational Reform of R&D
and Innovation in a Jurisdiction

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“The essence of the EPSCoR Experiment is to catalyze an S&T cultural transformation that is systemic and jurisdictional-wide …” that results in a highly competitive S&T enterprise

Strategic Priority 5: Develop “State Strategic S&T Business Plan” for Jurisdiction’s EPSCoR programs
Strategic Priority 3: “Improve the coordination with departments and agencies that have EPSCoR-like programs” (“communication between NSF and the other six EPSCoR-like programs”)

“Use the Planning Grant process to nurture state S&T Business Plan”

“Component of the short-term plan or proposal must make a persuasive case that the short-term plan contributes on a coherent and systemic manner to the proposed long-range plan”
The report states that the Jurisdiction has all the pieces of the puzzle to promote innovation, in good measure due to the Jurisdiction EPSCoR and EPSCoR-like programs, but it has failed at putting the pieces together to produce a robust “Entrepreneurial Ecosystem.”

“A systemic approach is needed that should be guided by the “Public Policy for S&T”

Response

“Creation of a Science, Technology and Research Trust to implement the S&T Policy”
EPSCoR 2020 and AAAS Report
Point to Five Key Words

**Synergy** - The interaction of two or more agents or forces so that their combined **effect is greater** than the **sum** of the **individual parts**.

**Systemic** (S&T and Innovation Enterprise is a complex system) – Of **affecting** the entire body or an **entire organism**.

**Catalyze** – To bring about; **initiate**.

**Cultural Transformation Needed for Innovation** – Changing **values, beliefs, and transactional activities** to make innovation central to the economy.

**Optimization** – The **procedures** used to make a system as **effective** or **functional** as possible.
The Challenge

- **S&T and Innovation** enterprise is a large complex and dynamic system.
- System reform has to overcome *stasis* and produce a cultural transformation that creates an entrepreneurial ecosystem in the Jurisdiction.
- The size of the S&T and Innovation enterprise requires that EPSCoR and EPSCoR-like programs act as catalyst of change and steer and harness the enterprise resources to achieve the cultural transformation.
- The design of the EPSCoR and EPSCoR-like funds have to be strategic.
The Barriers to Optimizing the EPSCoR and EPSCoR-Like Programs to Achieve Competitive R&D and Innovation

Internal (within the Jurisdiction)

- Impedance to multicampus and multidisciplinary collaborations
- Missing strategies for coordinating and obtaining synergy between S&T Policy, Innovation, and R&D
- Inability of EPSCoR programs to influence Jurisdictional S&T and Innovation Initiatives
The Barriers to Optimizing the EPSCoR and EPSCoR-Like Programs to Achieve Competitive R&D and Innovation
(continued)

External (National)

• Inserting into peer-review process the value of multidisciplinary and inter-agencies, collaborations

• Changing the beliefs and values of federal and other funding agencies so they support synergy and optimization of resources

• Lack of articulation among R&D related agencies that result in duplication of efforts
Case Study of Barriers that Impede Optimization of EPSCoR and EPSCoR-Like Projects

Puerto Rico’s only NSF-EPSCoR proposal that did not pass peer-review

“The Fatal Flaw”

We featured the synergy between NSF-EPSCoR, and EPSCoR-like programs in the context of the Jurisdiction’s S&T Policy
NSF EPSCoR

Development of target areas based on existing capabilities, growth potential, and contribution to the Island’s economy

PR-EPSCoR Thrust Areas Evolution

NSF EPSCoR Phase IV

- Biotechnology
- Engineering Infrastructure
- Environmental Research
- High Performance Computing
- Materials Science

NSF EPSCoR Phase V

- Integrative Biomolecular Processes (Biotechnology)
- Environmental Science and Engineering
- Information Technology Research
- Materials Science (Nanotechnology)

External Peer Assessment
American Association for the Advancement of Science

NSF EPSCoR Phase V Funds: $9.5M
Preamble to the Four Thrust Areas

“What follows is a brief description of the new thrust areas and the new foci targeted with them. The intellectual leaders and their campuses are given for each trust. **It is important to understand that these thrust areas are for all of the EPSCoR and EPSCoR-like programs and are not limited to NSF.** These currently include NASA-EPSCoR, DEPSCoR, DOE-EPSCoR, EPA-EPSCoR, and NIH-IDeA. However, since NSF EPSCoR remains the central strategy for the overall development of R&D with Puerto Rico, it is critical to describe the complete thrust area scheme here.”
Referees’ Response

Four of five reviewers failed to grasp the nature of the ongoing systemic reform in Puerto Rico.

Failed to see that “17+ research focused areas under the four thrusts went beyond NSF-EPSCoR proposal; they included: NASA-EPSCoR, DEPSCoR, DOE-EPSCoR, and NIH-IDeA”

This led reviewers to state: “That multiple focus areas (17) are too diffused for effectiveness”
Preamble to the Four Thrust Areas (continued)

Referees’ Response

and to summarize:

“Because of lack of focus, the likelihood that the proposal will result in more successful competition for research dollars … is not compelling”
We Learned our Lesson

In the next competition no mention was made of synergy and optimization of EPSCoR and EPSCoR-like programs to advance the Jurisdiction R&D and Innovation Agenda

But, we still use the optimization and synergistic strategy and

Voilá

Success
Multi-Campus/Multi-Disciplinary Institute for Functional Nanomaterials
The Institute articulates all major efforts in Nano Science and Technology in the Jurisdiction

Institute for Functional Nanomaterials

UPR-NASA-URC
Center for Advanced Nanomaterials
UPR-RP/UPR-M
NASA Glenn
NASA Ames
JPL-Caltech
NASA-$6.5M

MRI
Nano lithography
DPN Facility
UPR-H
NSF-$0.35M

NSF-CREST
Nanotechnology Center for Biomedical & Energy Driven Systems
UPR-M ; UPR-RP
NSF-$5M

PREM
NanoStructured Materials
UPR-M
NSF-$2.7M

NASA EPSCoR
Enabling Power Systems: Fuel Cells & Li Batteries
UPR-R
NASA - $1.3M

NASA EPSCoR
Experimental/Theoretical Development of Nano Sorbents
UPR-R/UPR-M
NASA - $1.3M

GK-12
NanoScience & Ecology
UPR-RP
NSF-$2.5M

ATE
Training Nano Technicians
UPR-H
NSF-$0.4M

Multifunctional Nanostructures for Magnetoelectric & Spintronics
UPR-RP/UPR-M
Argonne
SUNY Binghamton
UC-Berkeley
DOE - $2.2M

NIRT
Cell Death
Magnetic Fluid Hyperthermia
UPR-M ; UK; Rutgers U.
NSF-$1.2M

NSF-CREST
Nanotechnology Center for Biomedical & Energy Driven Systems
UPR-M ; UPR-RP
NSF-$2.7M

NASA EPSCoR
Enabling Power Systems: Fuel Cells & Li Batteries
UPR-R
NASA - $1.3M

NASA EPSCoR
Experimental/Theoretical Development of Nano Sorbents
UPR-R/UPR-M
NASA - $1.3M

Total Funds Received for 10 Projects: $23.45M
Strategies to Overcome the Barriers
Intra Jurisdictional Barriers

• Create a strong **EPSCoR State Committee** that has representation from the different types of academic institutions and includes industrialists and entrepreneurs

• Have the **leadership** of the **EPSCoR** and **EPSCoR-like programs** and members of the **EPSCoR State Committee** participate as active members in the Jurisdiction Policy making bodies

• **Select** leadership for the **EPSCoR** and **EPSCoR-like programs** for their **vision** and **leadership** in harnessing and promoting unity among diverse groups; diverse by institutions, disciplines, and demographics (**diversity** is the mother of **creativity**)
Strategies to Overcome the Barriers

External Barriers

• Promote a culture among peer reviewers that foster multidisciplinary and systemic vision; incorporate the S&T Policy of the Jurisdictions as a key criteria for the evaluation of synergy and optimization of resources

• Act on 2020 recommendations and use NSF leadership to enact coordination with other agencies that have EPSCoR-like programs to promote synergy, systemic thinking, and optimization of resources

• Require that the EPSCoR State Committee act as the coordinator of all EPSCoR and EPSCoR-like initiatives in a Jurisdiction
Strategies to Overcome the Barriers
(continued)

External Barriers

• Use the Office of Science and Technology Policy’s leadership to orchestrate a coherent plan to articulate all EPSCoR and EPSCoR-like programs so that they all work to achieve the common goal of nurturing the Jurisdiction’s “S&T Business Plan”
The Mission of the Office of Science & Technology Policy (OSTP) Includes:

“*Lead interagency efforts* to develop and implement sound science and technology *policies* and *budgets*”

“*Build strong partnerships* among federal, *State*, and local governments…”

“*Evaluate…effectiveness* of the *federal effort* in science and technology”