Education and the Economy:
The Importance of Research and Development

Presentation to the
Science, Technology and Telecommunications Committee

Santa Fe, New Mexico

November 17, 2022

THE UNIVERSITY OF NEW MEXICO

NM STATE

NEW MEXICO TECH
SCIENCE • ENGINEERING • RESEARCH UNIVERSITY

Presentation Overview

- **Impact of Research Universities** (Luis Cifuentes)
- **Return on Investment to New Mexico** (Nelia Dunbar/Ganesh Balakrishnan)
- **Statewide Collaborations**
  - NM EPSCoR (Ganesh Balakrishnan)
  - RALI West (David Hanson)
- **Advancing Collaborations** (Joseph Shepherd)

Impact of Research Universities

Combined Impact of Research Universities

Research Expenditures

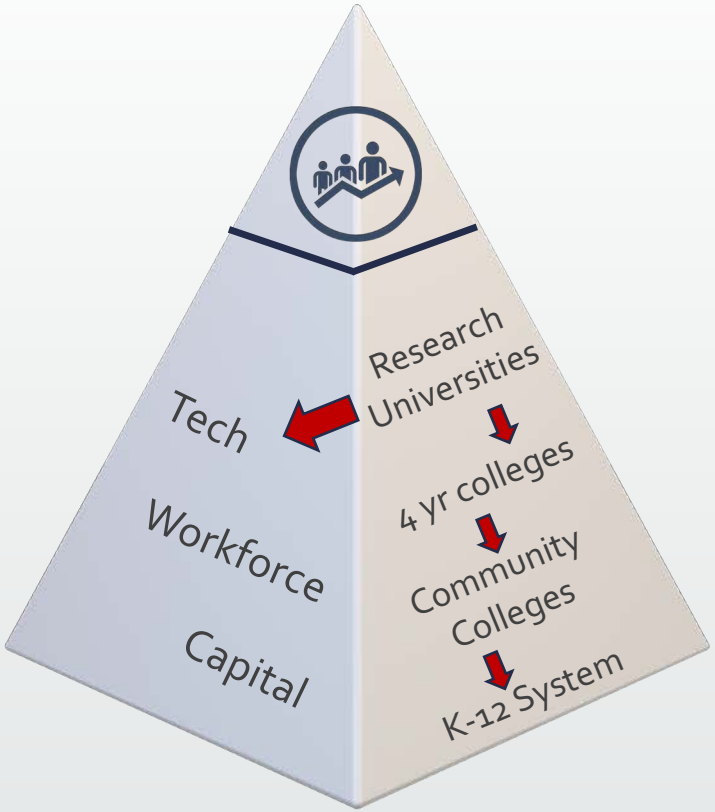
Sponsored research activity drives the procurement of goods/services and supports salaries

Graduate Degrees Conferred

Masters 1,792
Doctoral 306

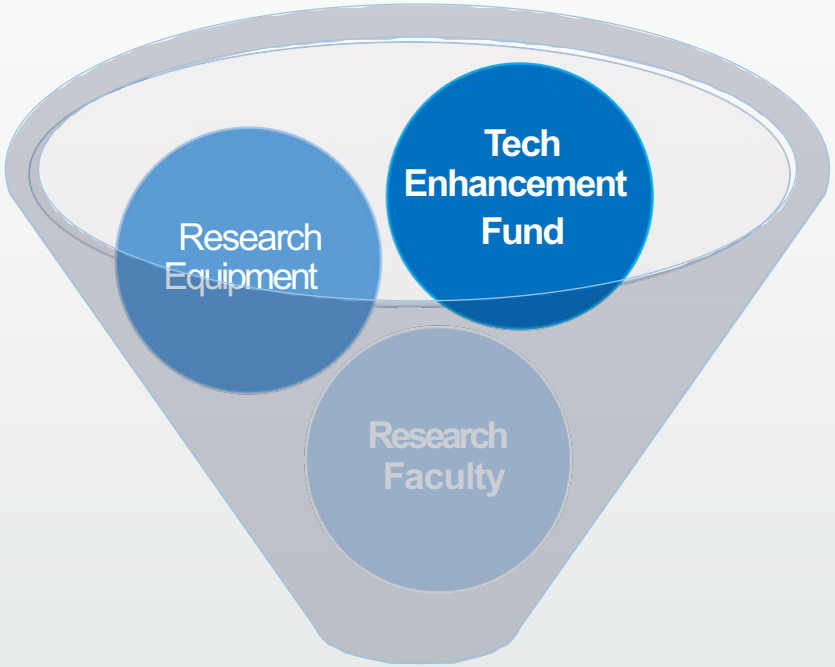
Research universities play a key role in developing a highly skilled and well-trained workforce

Drivers of Economic Impact



- Sustainable economic development depends on a healthy ecosystem of educational institutions
- Research universities play a critical role in both education and innovation that fuel economic development in New Mexico through technology, workforce development, and the attraction of capital investment.

Investing in the Future



New Mexico's Research Universities

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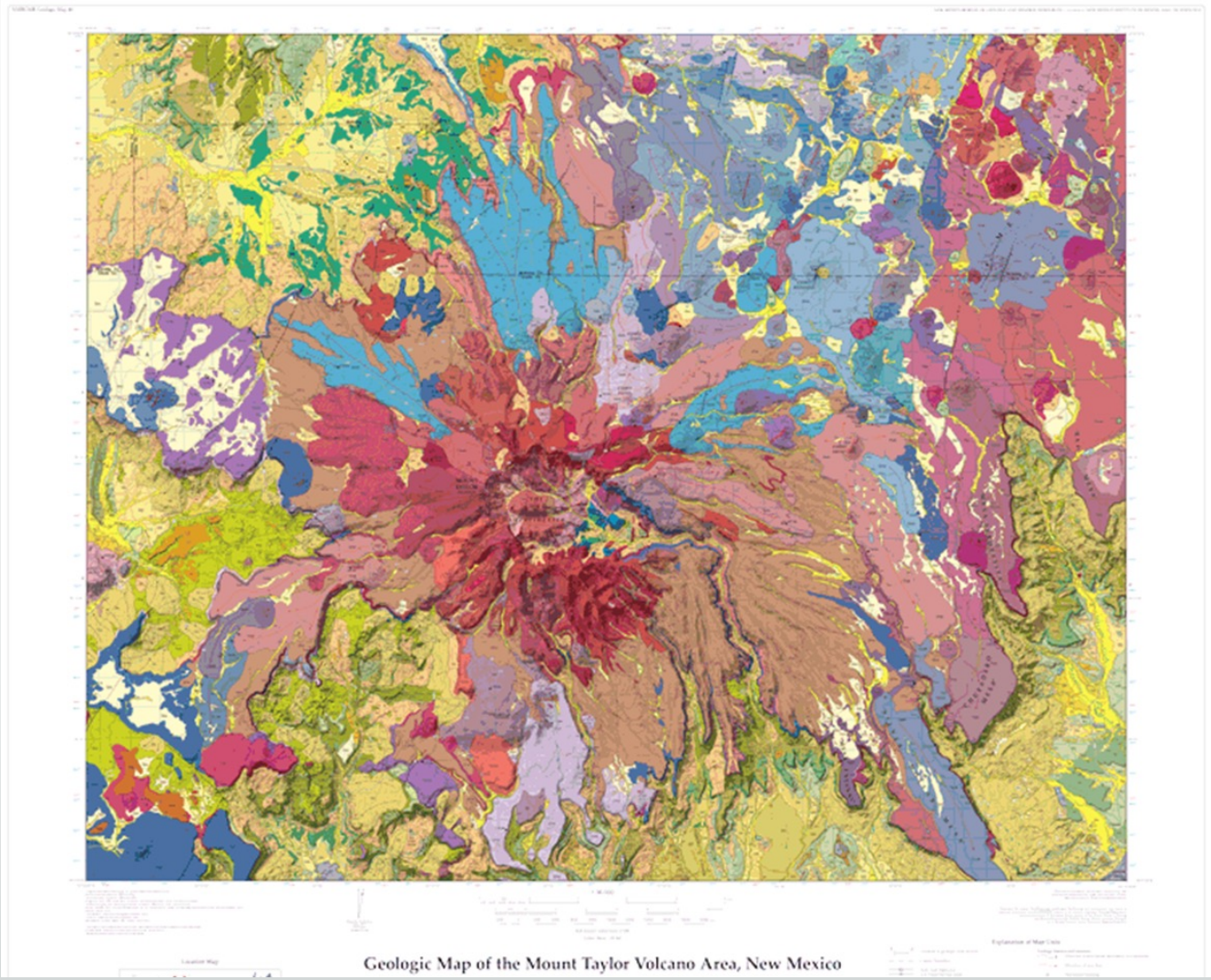
Return on Investment to New Mexico

Economic Benefits of Research- A Specific Example

- Example of Geological Mapping
  - Economic benefit study funded by Department of the Interior
  - 3 year effort, involving 49 states
  - Thousands of responses from the private sector
  - Geotechnical, real estate, water resources, construction, transportation, mineral and energy resources, tourism
  - Superfund sites
  - Economic benefit of around $100 for every $1 spend on geological mapping



Technological Enhancement Fund Impact: An Institutional Example- New Mexico Tech

- **Provides matching funds as required for some proposals**, particularly those from federal agencies, including the Department of Energy, Department of the Interior, National Science Foundation, NASA, and the Bureau of Reclamation, among others.
- **Examples of projects which depend on matching funds**
  - Water purification, water data, and water data access
  - Geological mapping, critical minerals research
  - Carbon sequestration in the San Juan Basin
  - Transportation research
- **New Mexico Tech is leaving federal money on the table because of not being able to provide matching funds**

An Example of ROI for Research Technology

State of NM invested in the UNM Center for High Tech Materials

- $10M over 5 years in the 1980's and a bond for a building in 1997
  - $30M of equipment was invested through grants and donations
  - Substatial cost-share was required for the equipment grants
- Research at CHTM has resulted in the award of 245 United States patents and 11 foreign patents.
  - More than $8.5 million in patent revenue was generated between calendar years 2009 and 2011.
  - Patent revenue grew to approximately **$51.5 million in FY20**.
  - > $30 million in patent revenues are estimated for FY21.
- **15 businesses** have been created by CHTM faculty and students.
- Since founding, **264 Doctoral students and 321 Masters students** have carried out their research at CHTM.

Dynamic Photonics

ARMONICA TECHNOLOGIES, INC

ACTOPROBE AFM INSTRUMENTS

Ennetix

K&A WIRELESS Next-Generation IoT Solutions K&A

New Mexico EPSCoR

ADVANCING COLLABORATIVE RESEARCH EXCELLENCE IN NEW MEXICO

Since 2001, NM EPSCoR programs have provided $182 million to New Mexico to build capacity in research infrastructure, cyberinfrastructure, and STEM workforce development and education.

Sustainable Modular Adaptive Resilient Transactive

$20 Million + 4 Million Cost-Share

4.7:1	201	33	$57 M	144
return on investment	students	faculty	in external funding awarded	peer-reviewed publications

RESEARCH CAPACITY

$7.2 MILLION In scientific & computing equipment purchased

Directly involved in NM EPSCoR projects **25 NM HIGHER ED INSTITUTIONS**

FUNDING TO NEW MEXICO

$207 MILLION Total NSF/DOE/NASA/USDA EPSCoR funding to the state since 2001

NSF EPSCoR Research Infrastructure Improvement Award + $4 Million State Cost Share **$20 MILLION**

Statewide Collaborations

Advancing Collaborative Research Excellence in NM

- Manage NSF EPSCoR NM SMART Grid Center ($24 million over 5 years)
- Partner with universities, national laboratories, industry, state government
- Facilitate education, outreach, and workforce development
- Cultivate research in emerging areas, e.g., quantum, dryland ecology

NM SMART Grid Center Team

47 Faculty

9 Post Docs

109 Graduate Students

65 Undergraduate Students

31 Staff/Other

Center for Research Excellence in Additive Technology and Education (CREATE) (2023 – 2028)

- $24 million; $20 million federal/$4 million state (Technology Enhancement Fund)
- Additive Manufacturing/3D Printing
- Industry Applications: Space, Medicine, Defense
- Potential for NM to Become World Leader

RALI WEST

Regional Collaboration

Research-driven regional economic growth

Clean water for health and sustainability

Clean energy for security and resilience

Meeting the needs of Indigenous and rural communities

- New National Science Foundation (NSF) Technology, Innovation, and Partnerships (TIP) Directorate
- First major opportunity: Regional Innovation Engines

NSF Engines Overarching Approach

Catalyze and accelerate:
- Regional-scale
- R&D-based
- Innovation ecosystems

Engines funding will:
- Advance critical technologies
- Address societal challenges
- Promote economic growth
- Cultivate regional talent

Regional economic impact

Culture of innovation

Comprehensive workforce development

NSF Regional Innovation Engines (RIE) Opportunity

Collectively, the Engines have three core functions:

Use-inspired research and development

Translation of innovation results to society

Workforce development to grow and sustain regional innovation

- **$160 Million over 10 years** in 3 phases to **stimulate 30-100x ROI for the region**
  - Nascent Phase: $15 M over 2 years
    - advance existing collaborations and build new ones
  - Emergent Phase: $45 M over 3 years
    - initial products from collaborations
    - **expand investment in the region 10x** over nascent phase (help NM capture industry and grants)
  - Growth Phase: $100 M over 5 years
    - collaborations maturing
    - **expand investment in the region 10x** over emergent phase (help NM capture industry and grants)

RALI WEST

Regional **A**dvancement **L**everaging **I**nnovation for **W**ater and **E**nergy **S**ecure **T**ransformation

- Intersects at five of NMEDD's nine target industries

NEW MEXICO ECONOMIC DEVELOPMENT DEPARTMENT

EMPOWER & COLLABORATE

New Mexico's Economic Path Forward

October 2021

Sustainable & Green Energy

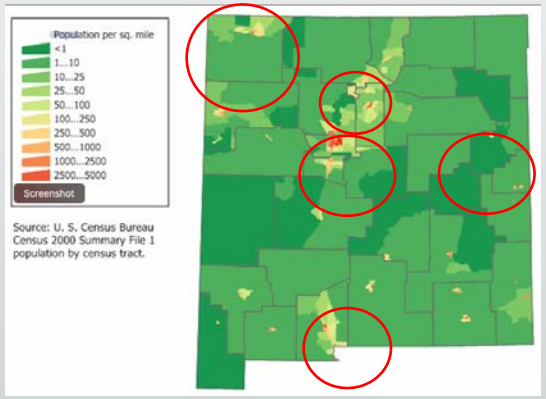
Biosciences

Outdoor Recreation

Sustainable & Value-Added Agriculture

Intelligent Manufacturing

- Innovation and growth near and beyond population centers



- Training the workforce at all levels across our state institutions

State-Funded Colleges, Universities, Tribal Colleges, and Special Schools in NM. hed.nm.gov

Advancing Collaborations

REQUEST

- Thank you to our policy makers for the $45 million investment during this past legislative session for matching funds through the Technology Enhancement fund
- The Council of University Presidents, New Mexico Association of Community Colleges and the New Mexico Independent Community Colleges is requesting an additional $25 million investment into the fund
- The additional investment will provide your research institutions with the opportunity to compete for research funding
- Our ultimate goal is investment in future and sustainable funding to enhance research and economic development in the State of New Mexico