

# Integrating Societal Concerns into Nanotechnology Research

## 21ST CENTURY NANOTECHNOLOGY RESEARCH AND DEVELOPMENT ACT

Potential public concerns over unintended consequences of nanotechnology have motivated calls for “responsible nanotechnology development” that addresses such concerns early.

Public Law 108-153 prescribes “ensuring that ethical, legal, environmental, and other appropriate societal concerns...are considered during the development of nanotechnology by...integrating research on societal, ethical, and environmental concerns with nanotechnology research and development” in order to “influence the direction” of nanotechnology R&D.

Yet, no clear precedent exists to guide implementation.

## R&D POLICY INTERVENTION POINTS

**Pre-R&D** – Authorize product: “Whether”

- \* Funding decisions (NSF, NAS, PCAST)

**Post-R&D** – Approve product: “Whether”

- \* Regulation of products (FDA, EPA, DOT)

**Mid-R&D** – Shape product: “How”

- \* Regulation of research (OSHA, ESH)
- \* Research into societal concerns (ELSI)

## WORKING ASSUMPTIONS

- \* Engineering research decisions are potential policy decisions, if research outcomes have social implications
- \* Engineering research decisions are driven by goals and limited by constraints and alternatives

## SEAMLESS INTEGRATION

This project will integrate societal considerations into all stages of a nanotechnology engineering research project.

- \* Incorporate societal concerns as additional constraints
- \* Expand perception of available alternatives
- \* Assess the utility, including any effects on research

## INITIAL RESULTS

Observations and interviews with graduate researchers in a CU Mechanical Engineering lab revealed that Graduate researchers have significant influence over technical decisions

- Unknowns and uncertainties → trial and error
- Responsibility to conduct research → freedom
- Participation in meetings → representation

Identifying potential negative consequences was difficult

- Possibly too early to do so in the research process
- Yet, easy to identify potential beneficial outcomes

Graduate researchers feel that considering societal concerns is the research group leader’s responsibility

- Implies that “others” are responsible and that societal considerations only come into play “before” research

Research decisions can take place iteratively by multiple agents and over time

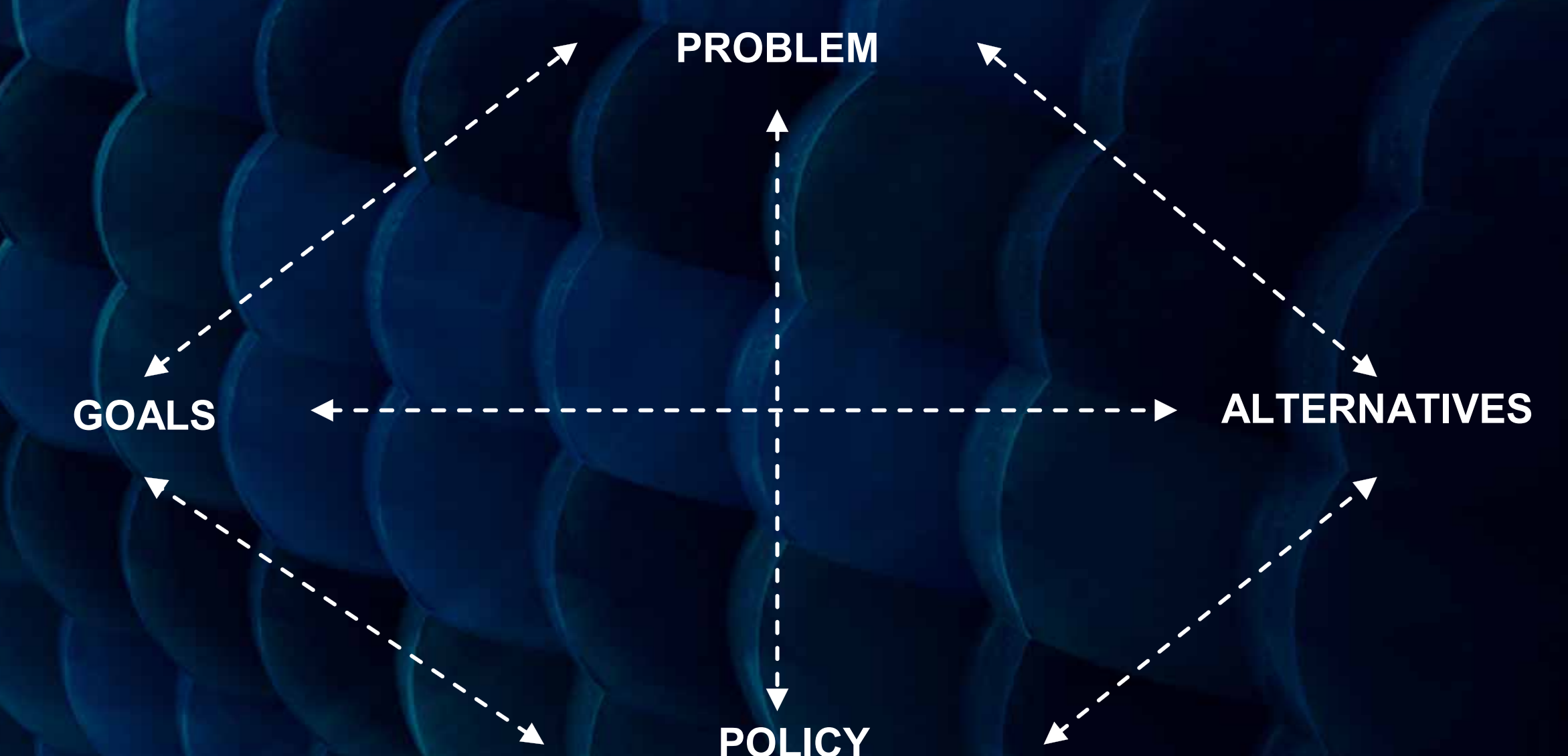
## HYPOTHESES

Subtle modulation of engineering research decisions by means of Seamless Integration

- \* Is possible
- \* Will advance “responsible nanotechnology development”
- \* Will not significantly compromise research progress
- \* May improve social desirability of research outcomes
- \* May improve awareness of broader policy context of nanotechnology research

## PROTOCOL

1. Identify research decision opportunity
2. Identify possible alternatives
3. Identify driving considerations
4. Document decision and rationale
5. Iterate among steps as necessary



***Making the protocol iterative: University engineering research decisions can take place iteratively, therefore the protocol must be scalable to multiple levels, timeframes, and re-visitation of research decisions***