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(3 and 21.6)

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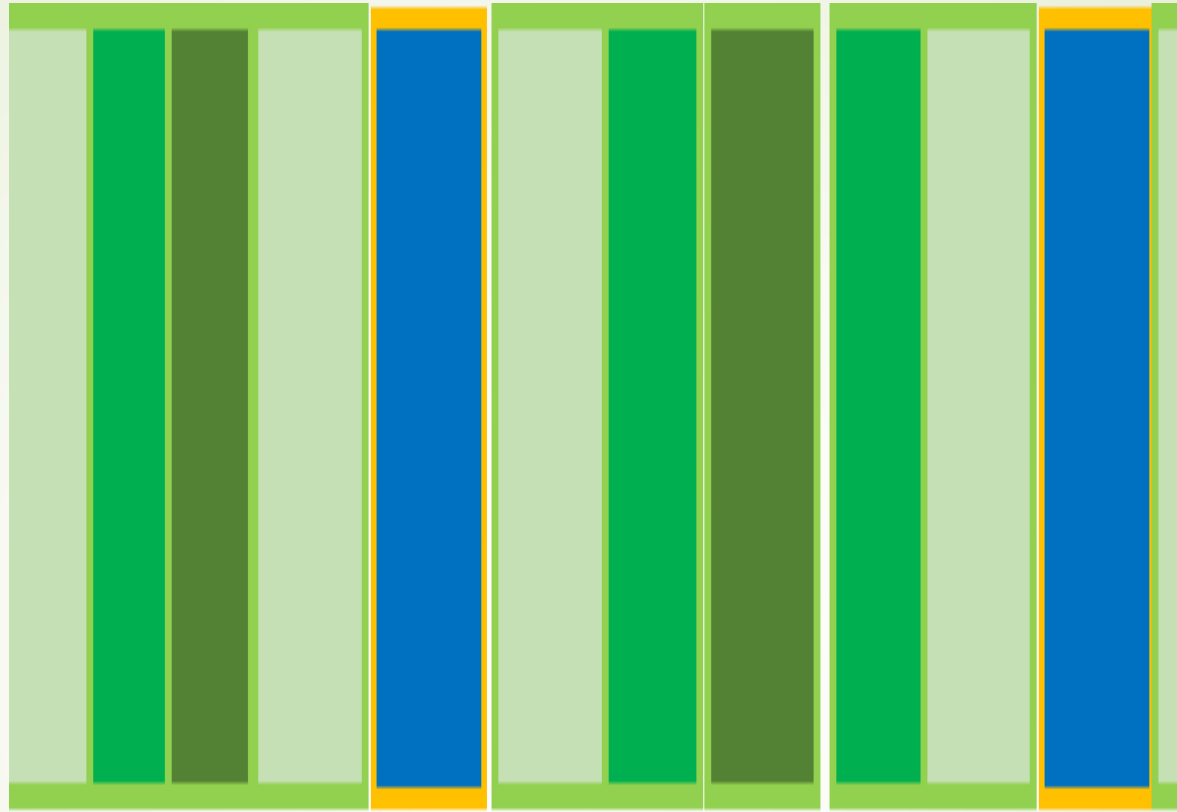
<https://www.tealeconomy.org>



My background and focus

- ▶ Data driven design tools for materials substitutions
- ▶ Currently focused on gas transport through multilayers
- ▶ Years of research in Biopolymers, Biomimetics, Bionano, and Green Chemistry and Materials
- ▶ Advising early stage start-ups in not-software

- ▶ Let's solve challenges faced by innovators and get more Green tech developed!



Protective packaging is often a multilayer

Different layers provide different complementary barrier and diffusion properties



Properties matter

- ▶ Either a good match or a straightforward engineer-around for differences
- ▶ Mechanical Properties
- ▶ Processability
- ▶ *Chemical and transport properties*
 - ▶ Modified by process history
 - ▶ HUGE factor in packaging, which also generates a big plastics problem

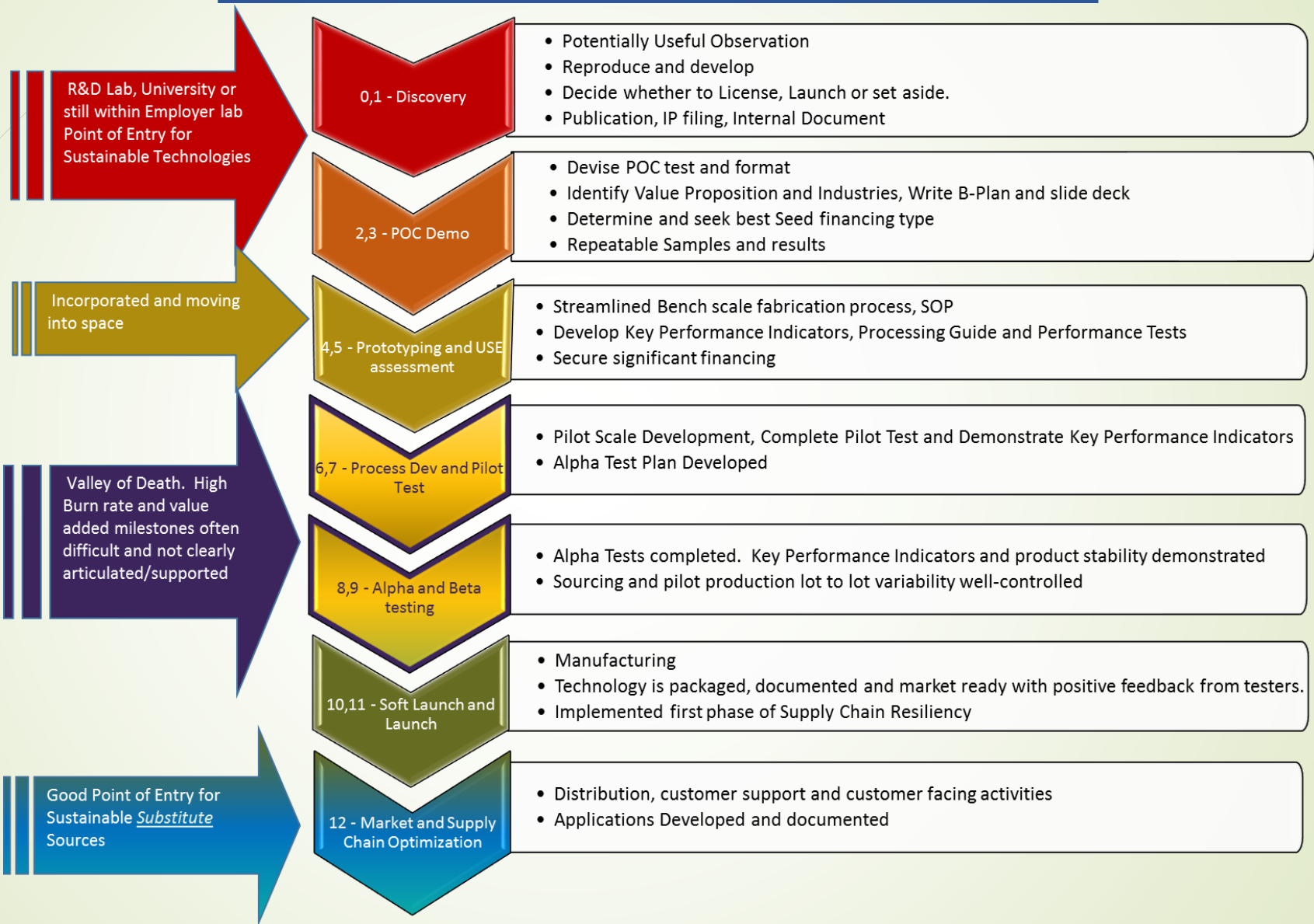


Next Generation Materials

- ➔ **Replacement** materials for current products
- ➔ **New materials** for new technologies
- ➔ Circular and fully degradable
- ➔ Environmentally friendly production
- ➔ Sourced “from Nature”
 - ➔ no new dinosaurs added to environment


Generation	Source Type	Typical Source	Recommendation
1	Foodstuff carbohydrates	Corn and Sugarcane	Possible diversion of food production into packaging feedstock. Carefully assess.
2	Biomass By-Products/ Ag Waste/ Cellulose	Tall Oil, Used Vegetable Oil, Corn stalks, Sugarcane bagasis, Ricestraw	Currently preferred source of biomass
3	CO(2) or methane	Algae, Carbon fixing bacteria	Technology may be the best for carbon reduction/capture. Not yet mature. Good area to support innovation!

Generalized Technology Development Pathway

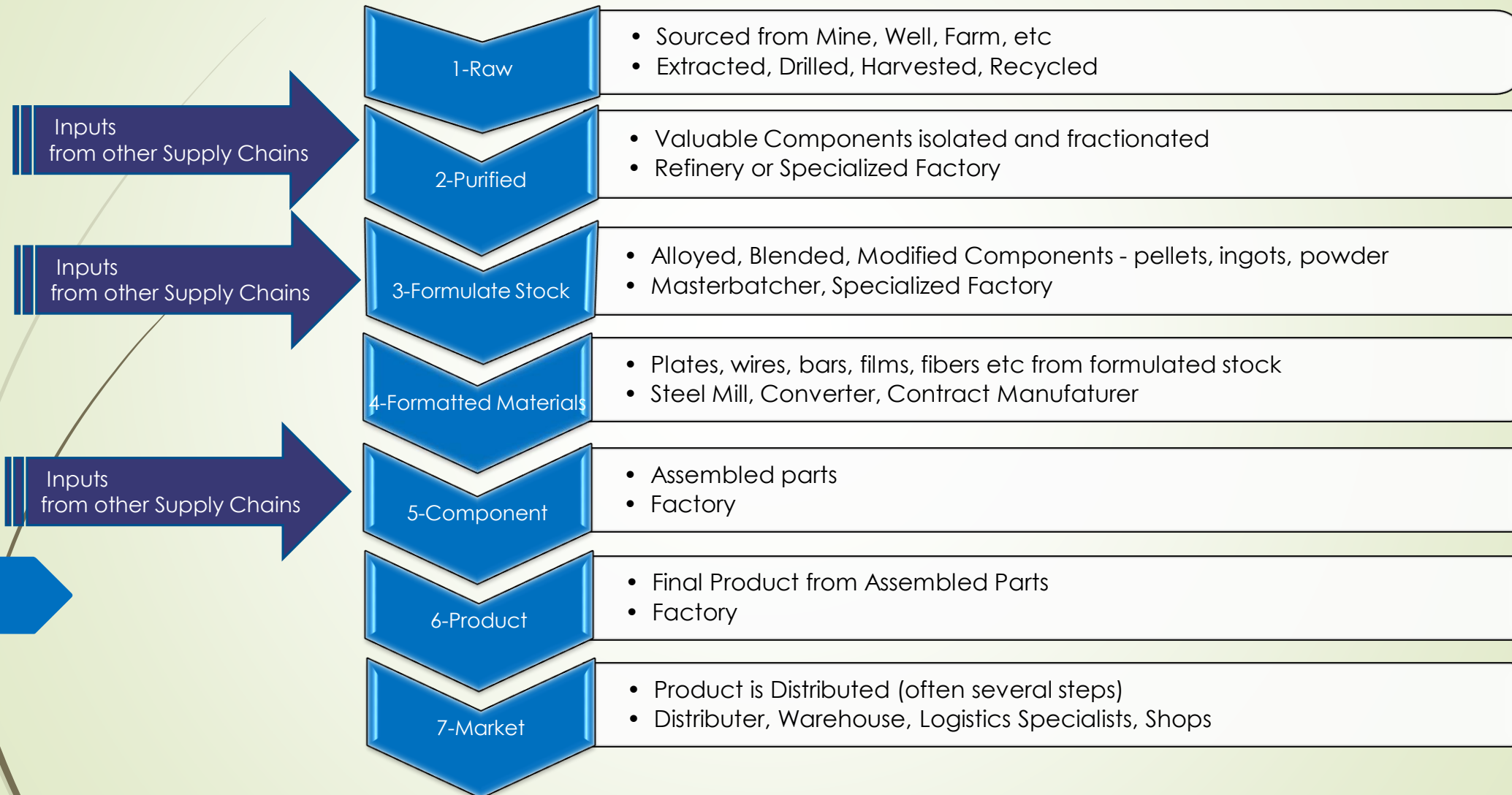





Complex Manufacturing is an Innovation Challenge

- Materials Science Innovations are often components of Complex Manufacturing Supply Chains
 - Materials Innovations often require complex manufacturing
 - Cycles of prototyping
 - Design for Manufacturing,
 - but this can be an innovation straightjacket
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Generalized Supply Chain





Next gen materials are Innovative Materials

How do they get into the Market?

- ▶ Where can they enter a partner supply chain?
- ▶ How do they get specified into a big manufacturers process?
- ▶ Into a Product?
- ▶ Where are the gaps and challenges that kill Innovations?
- ▶ How can we bridge these gaps and link together a supply chain?

Teal Economy Group

www.TealEconomy.org

Bringing the challenges for the Blue and Green economies

- **Materials of the Future**
- **Resilient Supply Chains**
- **Robust Innovation Ecosystems**