

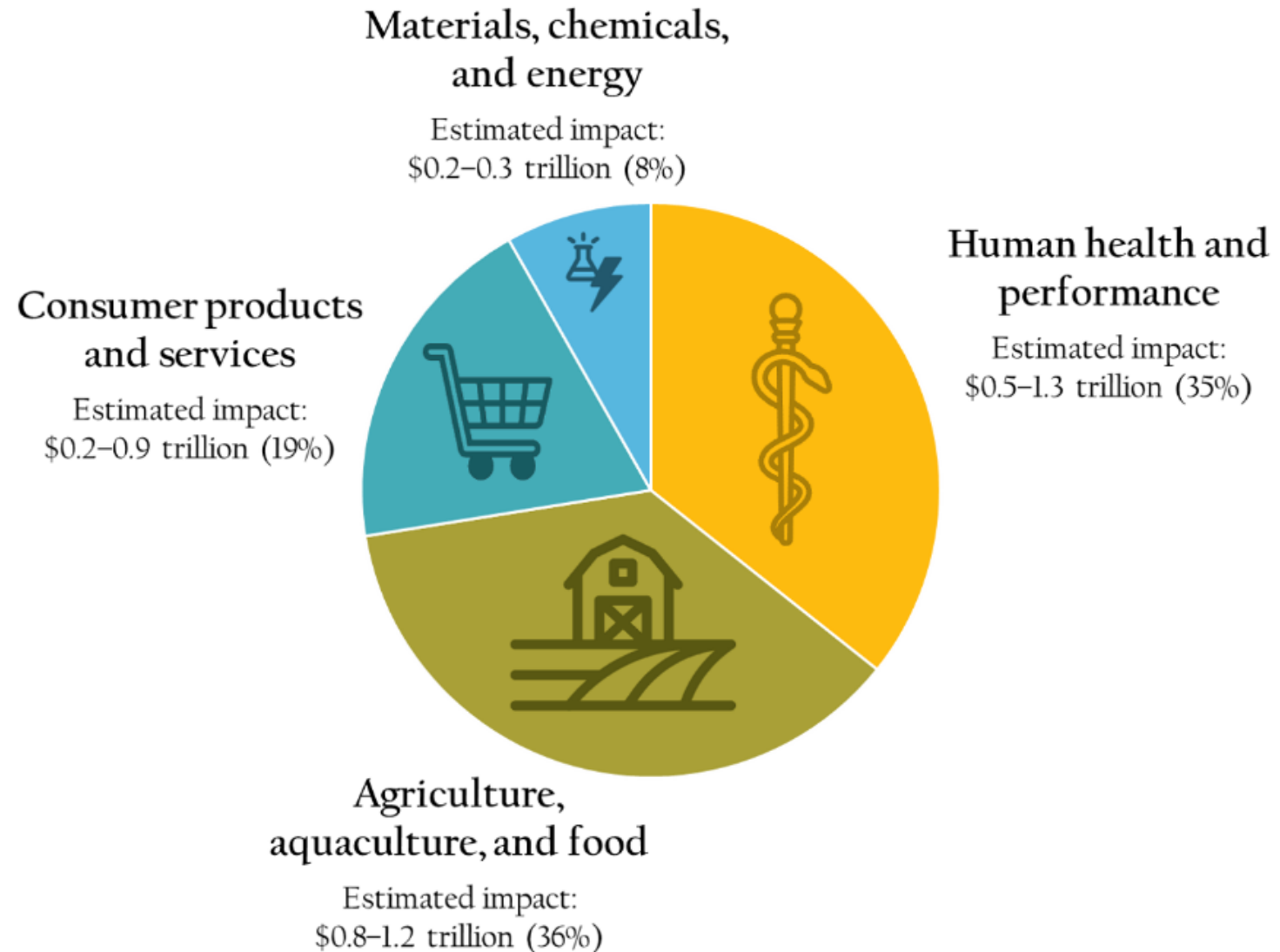
The Bioeconomy

An emerging and rapidly expanding economic sector that represents the portion of the economy based on products, processes, tools, and services derived from biological resources.

The National Academies estimated the direct economic value of the U.S. bioeconomy to be **\$402.5 billion** in 2016

When including indirect + induced effects, estimated total economic impact is **\$959.2 billion**.

The global bioeconomy could have direct annual economic impacts of **\$2-4 trillion** by 2030-40.

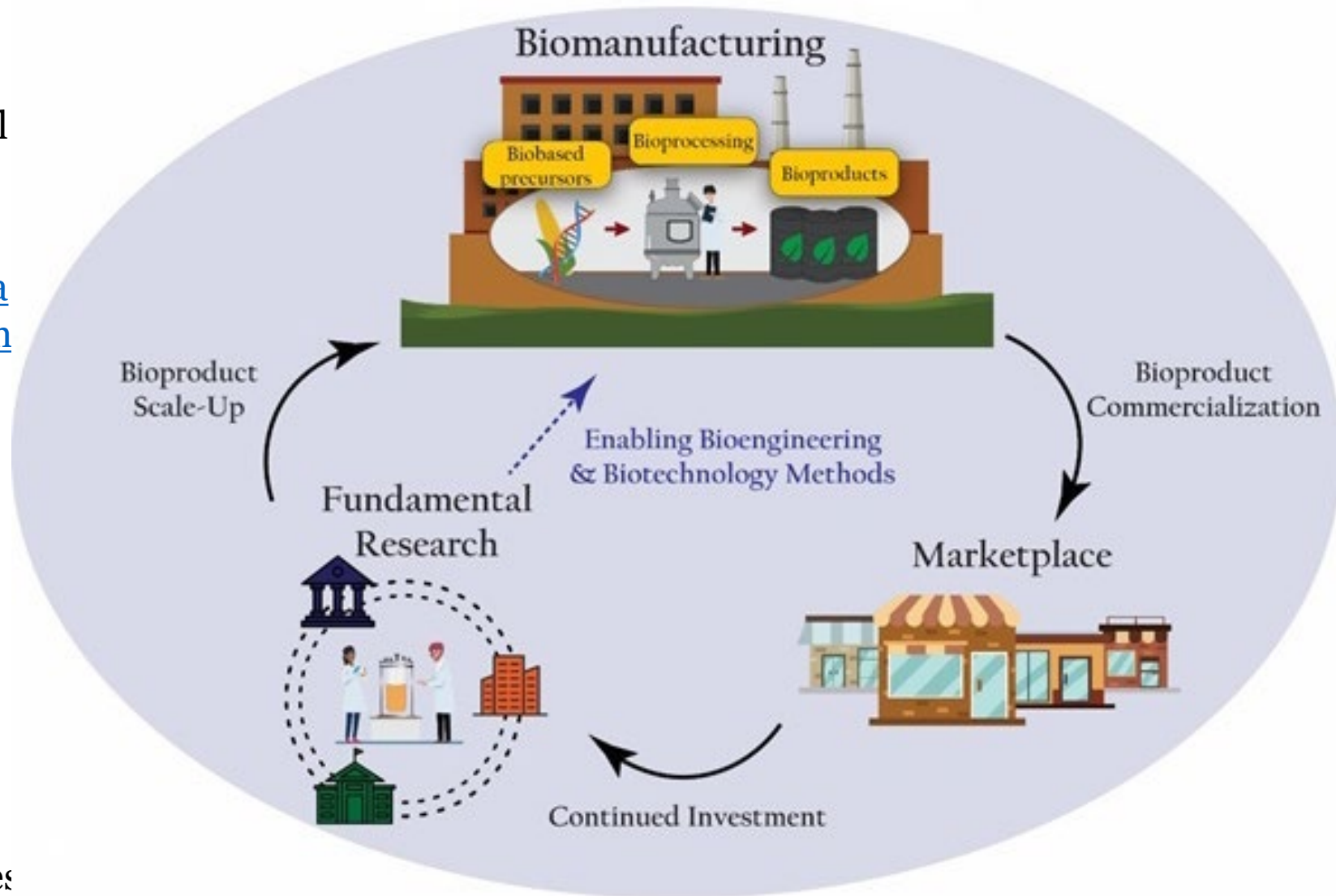


Estimated range of the potential annual direct economic impact on global economy in 2030-40.

Source: Adapted from Exhibit E5, McKinsey Global Institute (2020). The Bio Revolution: Innovations transforming economies, societies, and our lives.

Advanced Biomanufacturing

- Biomanufacturing is the engine by which innovative products of the bioeconomy are brought to commercial scale.
- EO 14081, [Advancing Biotechnology and Biomanufacturing Innovation for a Sustainable, Safe, and Secure American Bioeconomy](#)
- PCAST identified key gaps limiting the country's ability to realize the full spectrum of opportunities:
 - **insufficient manufacturing capacity**
 - **regulatory uncertainty**
 - **outdated national strategy**
- PCAST has proposed a series of recommendation to meet the challenges in each of these areas.



Strategic investments needed to fully capitalize on US global leadership in the biological sciences and bioengineering



- **Workforce education** beginning in high school through Ph.D.
 - 3 “hands-on” bioprocessing training/apprenticeship opportunities
 - 9 independent bioprocessing degrees (AAS, BS and MS)



- **Regional hubs** funded by CHIPS & Science Act should provide scale-up capacity linked to 2-yr and 4-yr institutions of higher education
 - NSF should partner with other agencies to provide funding/training opportunities to local universities and research institutions