

Socio-economic Implications of Lasers and Accelerator Facilities

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Why to conduct?

**public
concern**



A SOCIO-ECONOMIC IMPACT ANALYSIS

Clean & Safe

By 2050 there will be **just two working
age people** per one elderly person in Europe

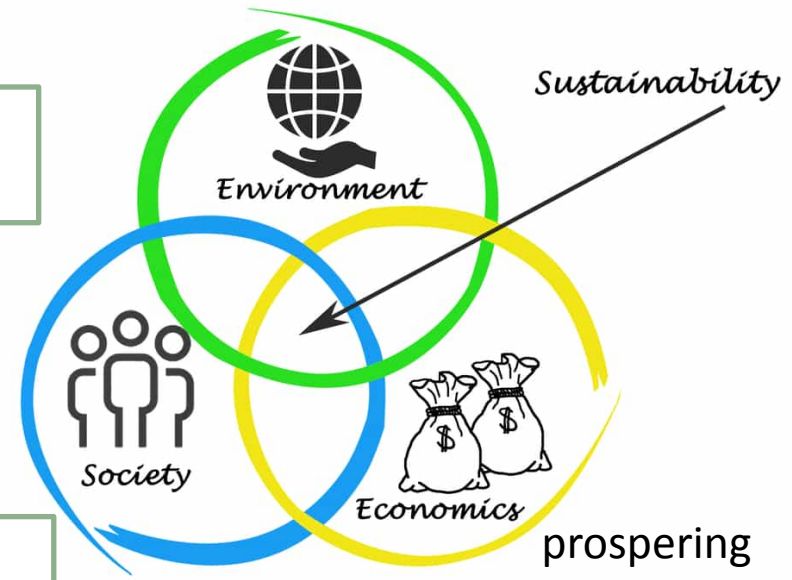
Aging
population



Source: UN Population Division, World Population Prospects 2015

Climate change

Productivity decrease



Healthy &
welfare



Which are the modern public

PUBLIC HEALTH ← concerns? → **PUBLIC WEALTH**



**Energy saving
& generation**



**Clean
air**



**Clean
Water**



**Food
Safety**



Medicine



**Growing
economy**



**Innovative Industry and
Technologies**

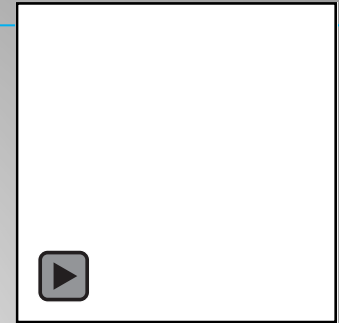


Laser and Accelerator applications: **MEDICINE**

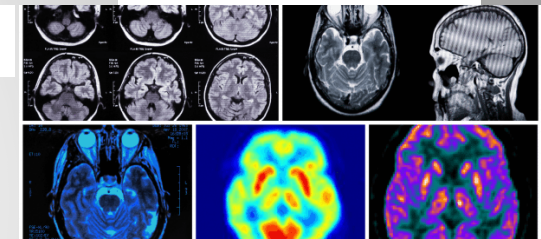
Laser-Assisted In-Situ Keratomileusis (LASIK) is the 1st commercial application of ultrafast lasers (2002)



- Fabrication of Functional medical devices (stents, tubes)
- Dental applications & Ear surgery
- Electron & Ion beams for Cancer therapy

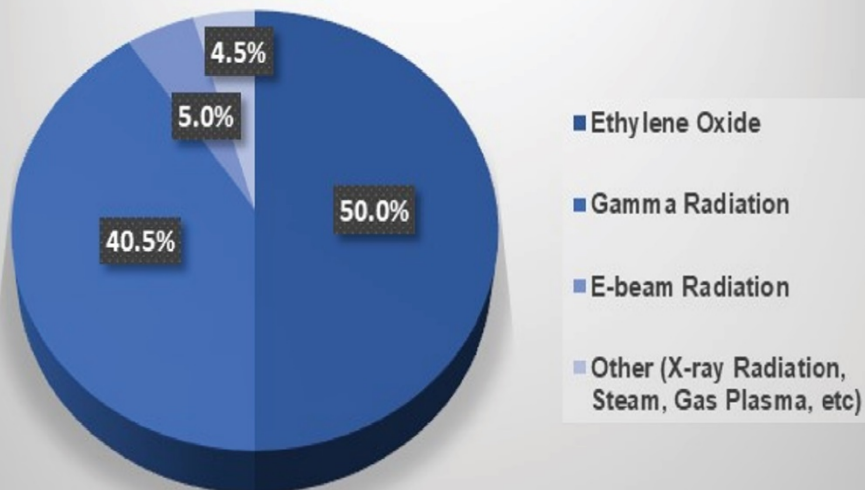


Medical Imaging



- Sterilization of medical instruments and products (pharmaceuticals, herbs, cosmetics)

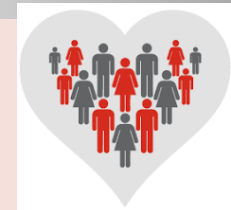
Global Sterilization Market



Accurate diagnostics

Effective prevention

Less invasive treatment



Saved lives, reduced cost/time

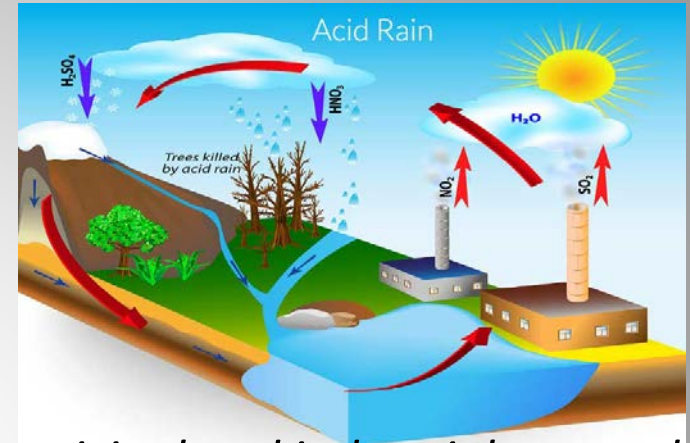


Laser and Accelerator applications: ENVIRONMENT PROTECTION

- Reducing acid rains

More than **90% of the sulfur dioxide** and **about 70% of the nitrogen oxides** are removed with an absorbed dose of about 10 kGy in the combustion gas.

- Lasers improve fabrication and efficiencies of thin film solar cells.



- Treatment of municipal and industrial wastes by Ionizing radiation

disinfection of
municipal wastewater
and sewage sludge

decomposition of toxic
substances in industrial
wastewater and
contaminated soil.

- Upgradation of cellulose waste into Animal feed



Major R&D program conducted by MIT & High Voltage Engineering Corporation supported by US NSF. **1.5 MeV electron accelerator** installed at the Deer Island waste water treatment plant in Boston

Ultrafast beams applications: **FOOD SAFETY**



1 out of every **10 people** suffer from food poisoning and around **420,000 die annually** across the globe (*source:WHO*)



Food
irradiation

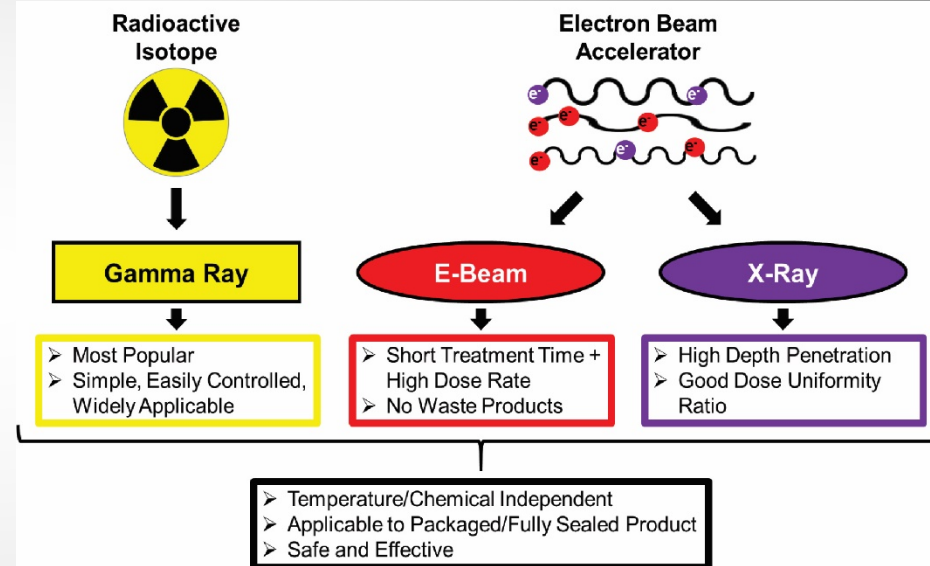


BENEFITS

- ✓ destroys microorganisms that cause foodborne illness, such as Salmonella, E. coli O157:H7, Campylo-bacterjejuni and Listeria monocytogenes
- ✓ eliminates the need for post-harvest fumigants that can leave undesirable residues
- ✓ reduces the need for pesticides when crops are cultivated
- ✓ reduces post-harvest losses due to insects infestation and spoilage
- ✓ extends the shelf life of foods



More than **50 countries** have approved the use of irradiation for about **50 food products**, and **33** are using the technology **commercially**



The global food irradiation market was valued at **US\$ 205.99 million in 2017** and is projected to exhibit a CAGR of 4.9% over the forecast period (2018 – 2026) to reach a total market size of **US\$325.82 million by 2026**.

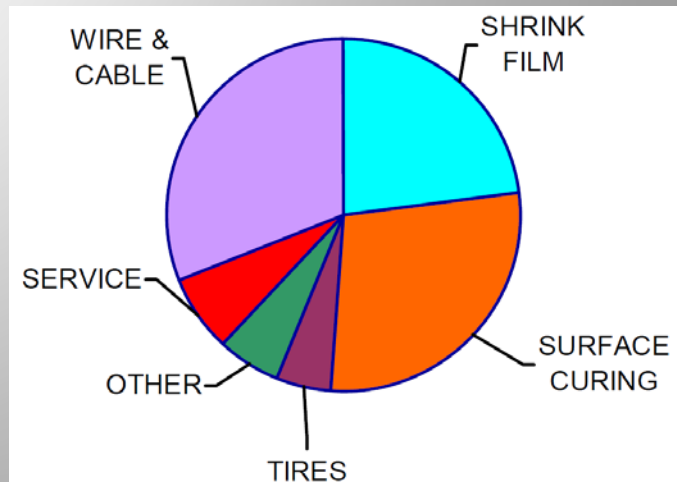
Laser and Accelerator applications: **INDUSTRY**



Industries	Processing									Products
	1	2	3	4	5	6	7	8	9	
Heavy Manufacturing	+	+	-	-	-	-	-	+	+	automobile tires, fuel/diesel injectors, heat and fire resistant wires, tubes, plastic pipes
Micromachining	+	+	+	+	-	+	+	-	+	solar panels, exhaust gas sensors, additive printing
Optics	+	+	-	+	-	+	+	-	-	very thin glass, sapphire, displays
Microelectronics	-	-	+	+	-	+	+	+	-	memory chips, microprocessors
Chemical industry	-	-	-	-	+	-	-	+	-	plastic foam/film, cellophane films, wound dressing hydrogels, plastic films, cellulose
Light Manufacturing	-	-	-	-	-	-	-	+	-	medical gloves, rayon fabrics, (viscose)

**1. Cutting, 2. Drilling, 3. Ablation, 4. Dicing,
5. Grafting, 6. Curing, 7. Scribing, 8. Cross-linking, 9.Welding**

E-beam Cross linking by industry

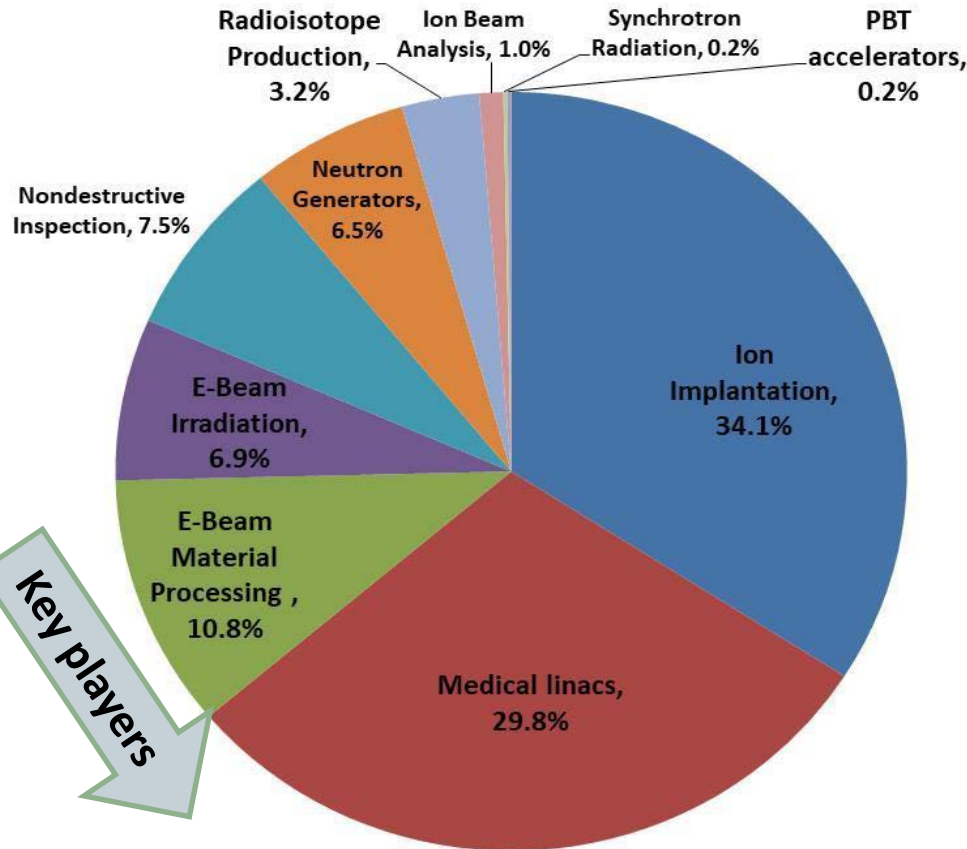


Commercial accelerator business

\$290million
2018

CAGR
10.0%

\$610
million
2025



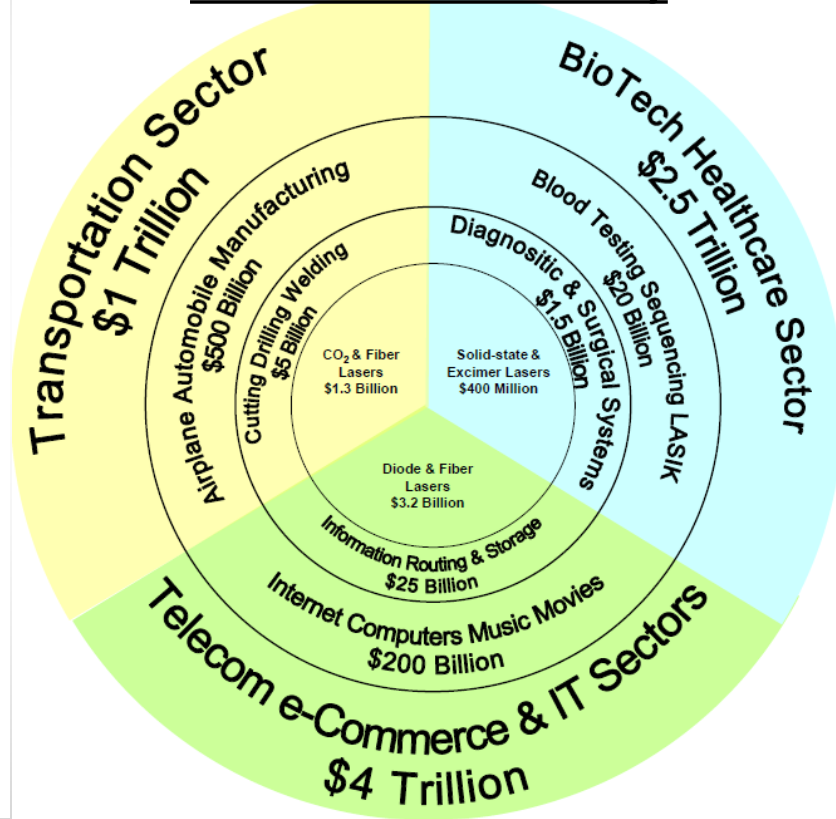
Industrial lasers business

\$12.9billion
2018

CAGR
4.65%

\$16.9
billion
2024

Lasers in US economy



Key players



The total sales of accelerators is ~ US\$5B annually

Laser and Accelerator applications: **PUBLIC DEMAND**

Ultrafast Lasers: Technologies and Global Markets

ID: 4659366 | Report | October 2018 | Region: Global | 125 Pages | BCC Research

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Global E-beam Accelerator Market by Manufacturers, Countries, Type and Application, Forecast to 2024

Publishing Date : Apr, 2019

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Enterprise Price US\$ 6,960.00

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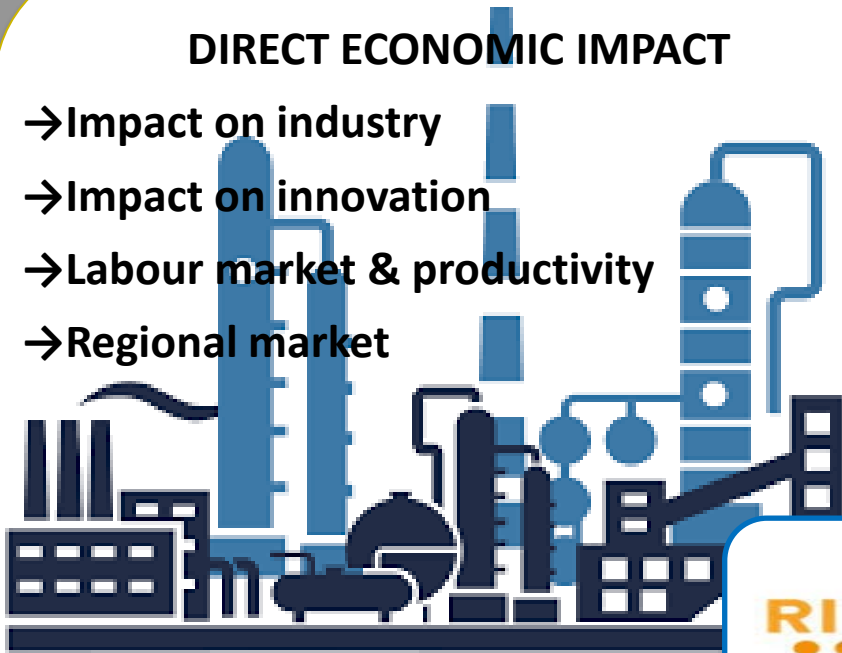
No of Pages : 109

Ask Your Query



DIRECT ECONOMIC IMPACT

- Impact on industry
- Impact on innovation
- Labour market & productivity
- Regional market



HUMAN RESOURCE IMPACT

- Research job & career development
- Skills development of auxiliary staff & non academic user groups
- Networks, social capital & international collaboration
- Wider effects from new competences



SOCIAL/SOCIETAL IMPACT

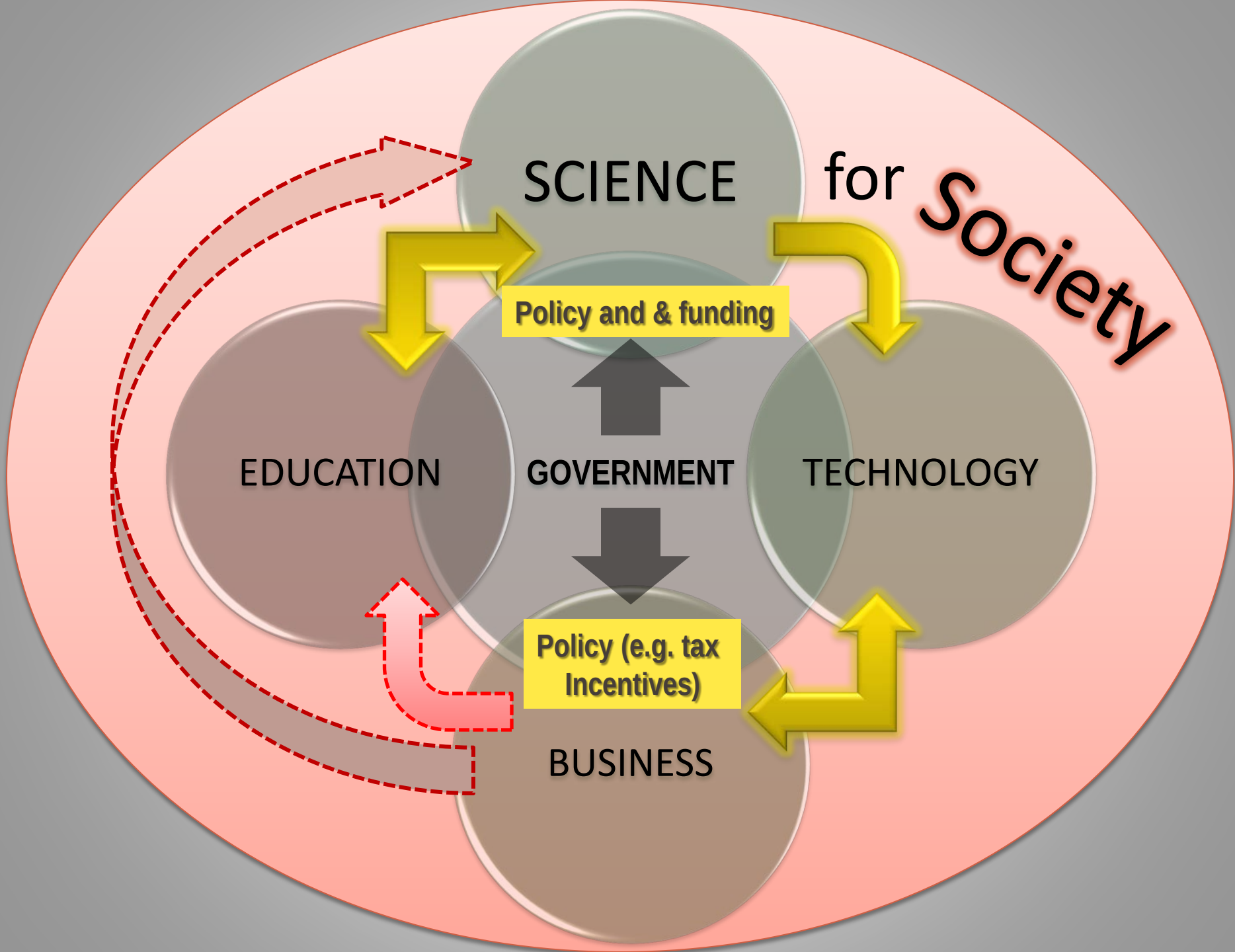
- New solutions, technologies, open access data for societal use
- Knowledge benefiting society in different domains
- Better jobs
- Public awareness of science & public engagement
- Environmental impact



POLICY IMPACT

- Impact on policies, regulations, standards & institutions
- Science diplomacy
- Co-funding & RI sustainability
- Ethics & trust in science







Thank
you!!