



SDG 9: Industry, Innovation and Infrastructure

University of Applied Sciences Burgenland

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



**Interpretation
of industry,
innovation and
infrastructure**



Photo by [ThisisEngineering RAEng](#) on [Unsplash](#)

Main goal: to build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

In addition to transport and energy supply systems, infrastructures also include communication and information networks, such as the internet for instance. Due to the growing population — by 2050 we expect to be 10 billion people living on the planet – and immigration to the metropolitan areas, a need for a major change in infrastructure is coming our way. Lots of new investments will be made and new houses, roads, electricity, internet and water supply systems need to be built. In order to make these new structures also sustainable, the UN demands significant investments in research and development, so that in the future, resources will be used more efficiently, and environmentally-friendly technologies will be available for use. The poorer countries, in particular, are to be supported in their development through affordable loans.

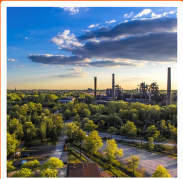
What is a resilient infrastructure?



Infrastructure resilience:

Strengthening the critical (vulnerable) infrastructure required for city operation may include but is not limited to: transport (roads, rail, airports and other ports), vehicle and heating fuel suppliers, telecommunication systems, utilities systems, hospitals and healthcare facilities, educational institutes and school facilities, food supply chain, police and fire services, etc. — carrying out essential functions during and after a disaster, where they are likely to provide recovery and relief.

Source: [unisdr.org](https://www.unisdr.org)



Estimates show that \$94 trillion in infrastructure investments are required by 2040 to meet the global demand for access to electricity, transportation, telecommunication, and water services.

Source: [gihub.org](https://www.gihub.org) and [gfdrr.org](https://www.gfdrr.org)

“At the beginning of the pandemic, 53 “Wien Energie” employees temporarily moved into the power plant site, so that people could still enjoy light, heating and hot water without any disturbance!”

Source: [wienenergie.at](https://www.wienenergie.at)



What about industrialization?



Inclusive and sustainable industrialization:

...is a driver of development and increases productivity, job creation and generates income (impacting several other SDGs). As industry develops, it drives an increase of value addition and enhances the application of science, technology and innovation, therefore encouraging greater investment in skills and education, and thus providing the resources to meet broader, inclusive and sustainable development objectives.

Source: sdgs.un.org



Did you know that in 2020, IBM ranked as the most innovative firm as it registered 9,130 patent grants of artificial intelligence, blockchain, cloud computing and quantum computing.

Sources: [statista.com](https://www.statista.com) and [alcorfund.com](https://www.alcorfund.com)



"A few weeks ago, one of the internet providers in Vienna had some issues with their services and internet simply didn't work. Paul was among the people affected – it was just a few hours, but it completely turned around his day, because of work & home schooling."

What's sustainable innovation?



Sustainable innovation

...means traditional innovation boosted and driven by concern for resources and the environment. Businesses are embracing the idea that resources shouldn't be used faster than they are replenished, and that waste generation shouldn't exceed the carrying capacity of the ecosystem — pointing to the need for circular innovation practices aligned with the principles of the circular economy.

Sources: ideascale.com and acatech.de



Did you know that sustainable innovation is more collaborative because it is a trans-disciplinary concept? Companies must reach out across industries to develop and unlock the value of sustainable innovations — changing the corporate “value chain” to more of a “value web.”

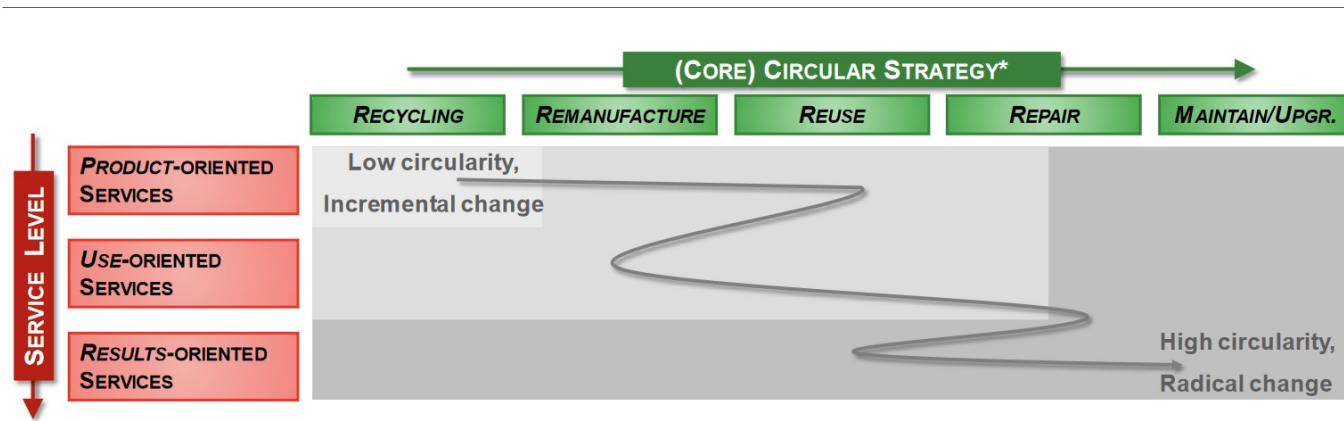
Source: ideascale.com



“I think it is quite remarkable that coming from the original understanding of industrialization — from agriculture to manufacturing of goods — we are finally thinking about including fair working conditions, innovation and development of new greener production technologies in the equation.”



Model: the circular business maturity grid



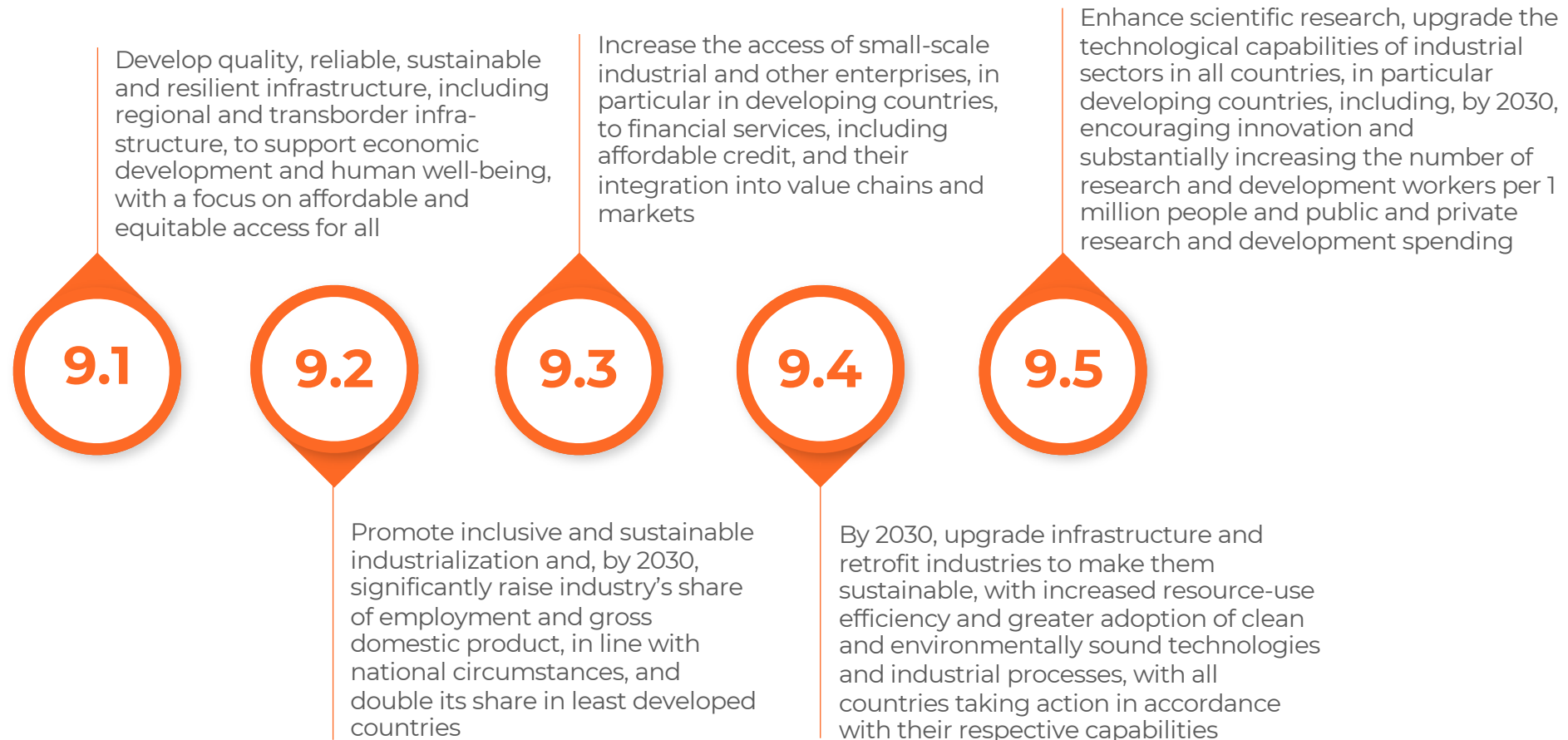
Source: uol.de



Did you know that there are approximately 30 billion connected devices on earth? Together, they form the *Internet of Things* (IoT). An EU-funded project pairs circular economy with IoT as an enabler by design.

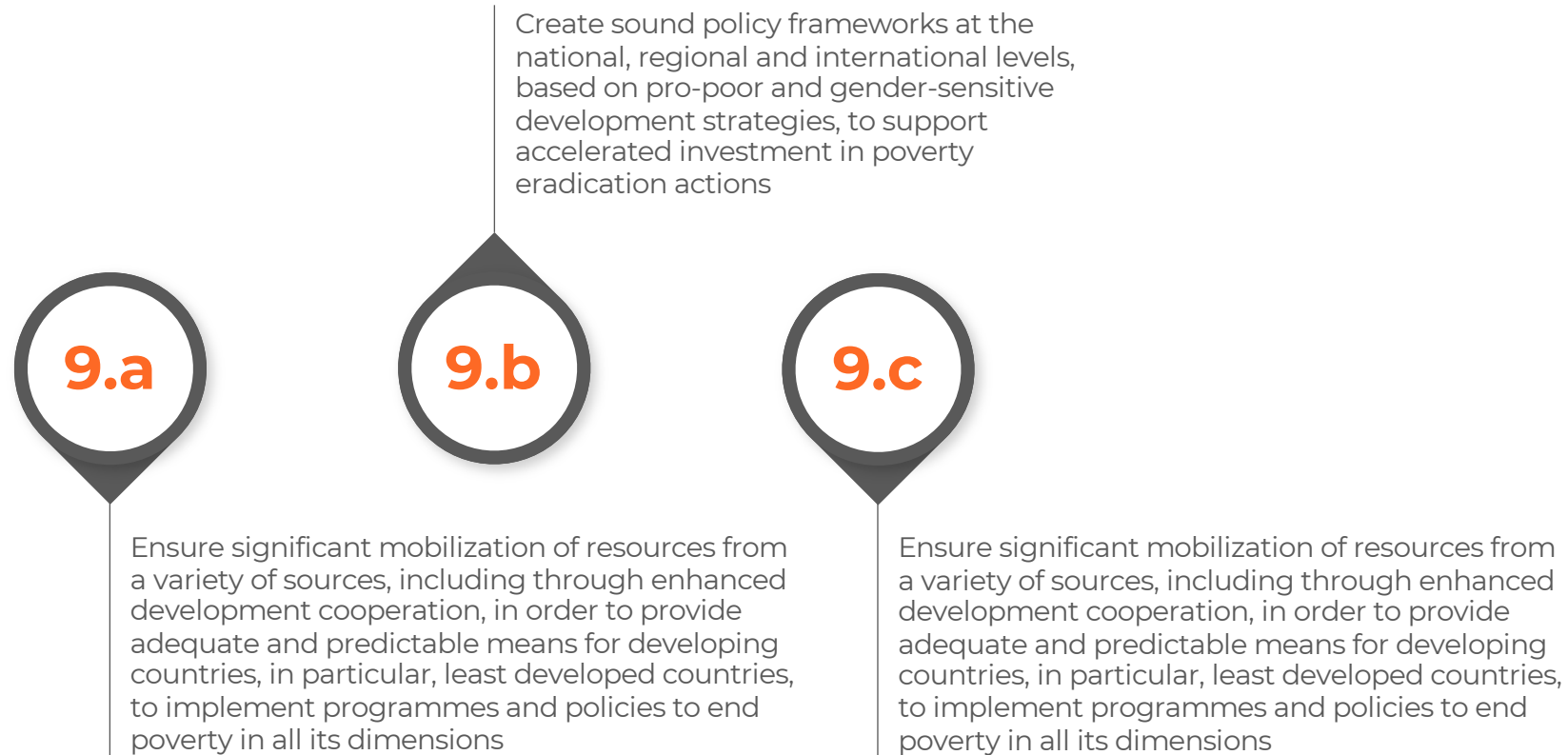
Sources: sap.com and cordis.europa.eu

Subgoals: targets



Source: un.org

Subgoals: measures



Source: un.org

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**Current state of
industry, innovation
and infrastructure**

Report 2020

The Sustainable Development Goals Report 2020



Source: un.org

The Sustainable Development Goals Report 2021



Source: un.org



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE BUILD RESILIENT INFRASTRUCTURE, PROMOTE INCLUSIVE AND SUSTAINABLE INDUSTRIALIZATION AND FOSTER INNOVATION

BEFORE COVID-19

MANUFACTURING GROWTH WAS DECLINING



FINANCING FOR SMALL-SCALE INDUSTRIES IS NEEDED FOR THEIR SURVIVAL THROUGH THE CRISIS

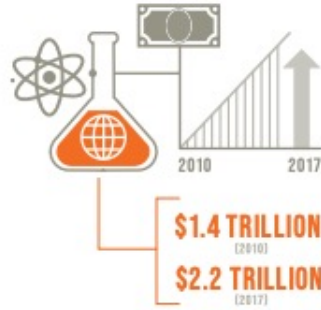


COVID-19 IMPLICATIONS

THE AVIATION INDUSTRY HAS SUFFERED THE STEEPEST DECLINE IN HISTORY



INVESTMENT IN R&D IS GROWING BUT NEEDS TO ACCELERATE

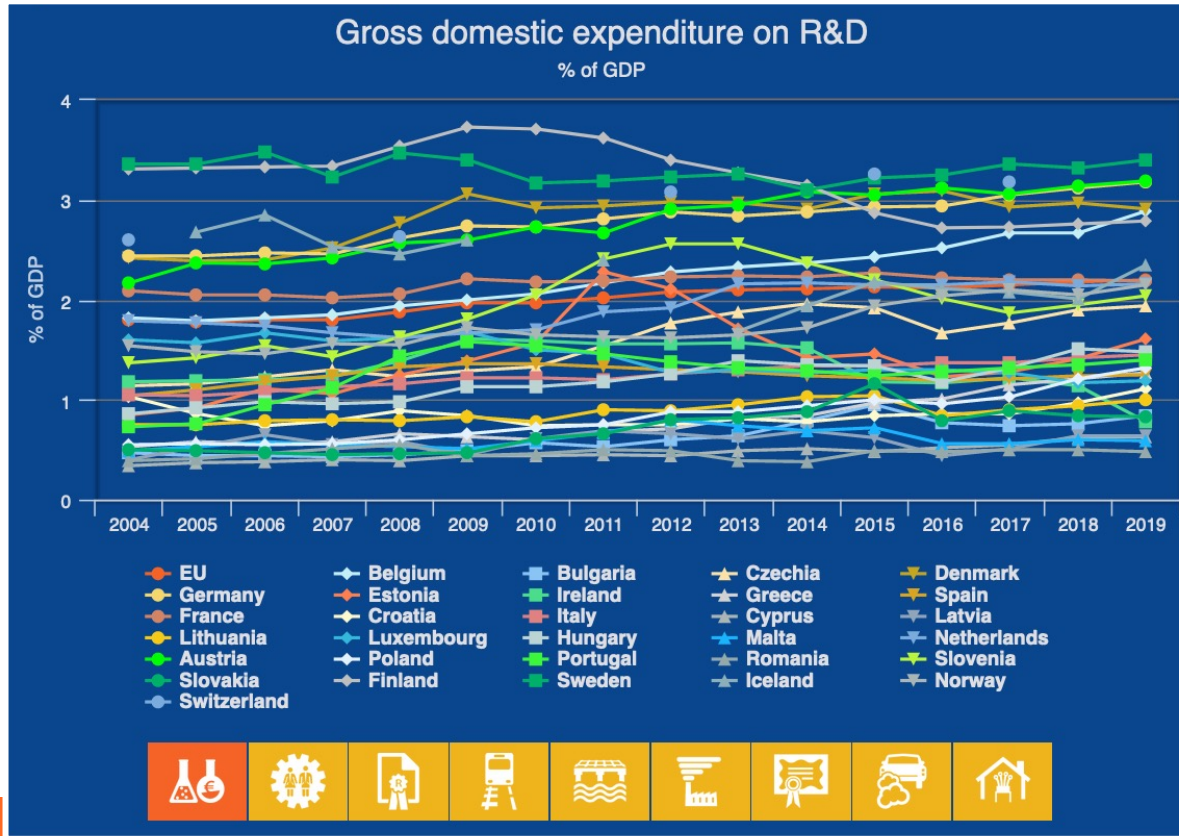


FEWER THAN 1 IN 5 PEOPLE USE THE INTERNET IN LDCs (2019)



Source: un.org

Some European statistics



Source: ec.europa.eu

Did you know that Sweden, Austria and Germany are leading in the R&D expenditure with a little over 3% of their gross domestic product (GDP) dedicated to R&D?

Source: ec.europa.eu



"I always read in articles about the need for innovation, why don't we have dedicated budget for that, why is no one willing to pay for it?"



Implementation in Austria as of 2020

Target	National indicators (selected)	Trend
9.1	All-season roads	✓
	Transport performance by HGV	:
	Transport performance by rail	↑
	Passenger transport by rail	↑
	Energy consumption in transport	↓
	Greenhouse gas emissions in transport	↘
9.2	Share of employees in high-tech and medium-high-tech goods manufacturing	↑
9.4	CO ₂ emissions of industry per unit gross added value	↑
9.5	Gross domestic expenditure on R&D (GERD) as a percent of GDP (research intensity)	↘ TARGET

Source: Statistics Austria. 8-year trend 2010–2018 (if figures missing, at least 7-year trend) in 4 categories (↑↗↘↓) if there is a clear target (quantitative/normative); ✓ (part of the) indicator target achieved; : calculation of trend not possible. More information about methodological questions can be found in the National Indicator Report 2020.

- > From 2015 to 2018, the transport performance by heavy goods vehicle traffic rose by 14.8% while that by rail was up by 5.8%.
- > Transport-related energy consumption rose +8.6% from 2010 to 2018.
- > The CO₂ emissions of industry per unit gross value added dropped from 2010 (232.7 t CO₂ per million EUR) to 2017 (197.2 t CO₂ per million EUR).
- > The share of employees in high-tech and medium-high-tech rose from 2010 to 2018 from 5.3% to 5.8%.



Did you know that greenhouse gas emissions from transport rose in Austria by 7.9% from 2010 to 2018?

Source: sustainabledevelopment.un.org

Main issues to solve in Austria as of 2020



While separating waste and reusable materials is working well, high-tech sorting facilities are missing



Research-intensive areas need more staff and more research-friendly environments



Sustainable transformation of the public transport infrastructure for people and goods (rail traffic)



Did you know that the Austrian investment in R&D amounted to 3.17% of its 2018 GDP, still considerably below the national Europe 2020 target of 3.76% of a country's GDP.

Source: un.org

"It seems that there is a conflict between our national sustainability goals and what the government subsidizes. I wonder which government will have the guts to close that gap, and how long it will take for us to get there."



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**Potential
contributions
Learning activity**

Before thinking about potential contributions...

- Imagine an organization (business).
What is the core purpose of this organization*?
- Who are this organization's internal and external stakeholders?
- How do “innovation and infrastructure challenges” impact this organization (its purpose, its stakeholders, its operation, its viability)?
- What challenges and/or costs emerge from these “innovation and infrastructure challenges” in this organization?
- On the other hand, what opportunities and/or benefits arise?
- With all this in mind, what contributions** might this organization make to reach SDG 9 within its sphere of influence via inward and outward actions?

* Meant here are all sizes, all types

** Consider contributions inside the organization (referring to everything that is a resource to the organization and is directly or indirectly controlled by the organization, for instance, human resources, know how, monetary and material resources) and the outside of the organization (referring to everything outside of the organization that it can influence but lies outside of its control, for instance, policy change, partnering with other organizations, etc...)



Potential contributions by educational institutions

The purpose of educational institutions is to educate and train for life and for particular professional interests.

In terms of SDG 9, the tasks lie in developing potential solutions (innovations) for the challenges at hand: sustainability-oriented infrastructure that supports a massive transformation toward circularity in industry and business.



Did you know that in 2020, only 40% of Austrian households enjoyed high-speed internet connections while Slovakia's share was 50% and the European average 60% – while Malta was leading with 100%?

Source: ec.europa.eu

Potential contributions by educational institutions, cont.

Potential inward actions:

- adjust educational programs to highlight inclusive and sustainable innovation
- in terms of ICT, make sure the programs are inclusive and available to all, especially during times of national crises (such as for instance, COVID-19)
- incentivize students to use sustainable means of transport, for example, by subsidizing public tickets or providing parking for bicycles and showers for bikers

Potential outward actions:

- lobby for direct public transport options to campuses for staff and students, change car fleets to e-mobility options
- consider partnerships with industry players and other institutions for collaborative sustainability-oriented R&D
- co-create partnerships with industry players concerning student projects and job placement in green technology

Potential contributions by municipalities


The purpose of municipalities is to plan, manage, and improve public work and services to the community. In terms of SDG 9, the tasks for municipalities lie in co-developing and role-modelling sustainability-oriented solutions for transportation and infrastructure.

Potential inward actions:

- upgrade infrastructure to reach maximum energy-efficiency
- offer e-mobility solutions for inhabitants and tourists (e-bus, e-car loading stations)
- train public service staff in the topic of inclusive and sustainable industrialization

Potential outward actions:

- lobby for and collaborate with regional partners (cities, towns, villages) to improve public transport in the region
- collaborate with local partners (inhabitants, hotels, etc...) to reduce traffic through town
- offer incentives to sustainability-oriented industry players



"In 2019 and for the fourth time in a row, the number of holders (852,000) of an annual pass for public transportation within Vienna surpassed the number of registered vehicles (by 143,000)."



Did you know that with a route length of 225 km, Vienna's tram network is the sixth largest in the world?

Potential contributions by corporations and other organizations

The purpose of for-profit organizations (i.e. business) is to provide a service in exchange for resources (i.e. money). The purpose of non-profit organizations is to impact society in a certain way. Both need to generate and/or collect adequate resources to pay for their operations and activities and/or make profit.

In terms of SDG 9, the opportunities for contribution may vary greatly between different types or sizes of organizations, but their core contributions to society for reaching SDG 9 are to commit to innovation and R&D-activities and to question their own impact on emissions and public infrastructure through their operations and transport.



Did you know that the Austrian Research Promotion Agency (FFG) offers dedicated funding for impact innovation with up to 75.000€ per project?

Source: [ffg.at](https://www.ffg.at)

Potential contributions by corporations and other organizations, cont.

Potential inward actions:

- implement transparent and inclusive sustainability efforts for the production and transport of goods
- promote internal sustainability-oriented R&D efforts (incentivize employees by funding their ideas)
- develop creative fun activities (competitions) and offer awards for employees using public transportation or bikes

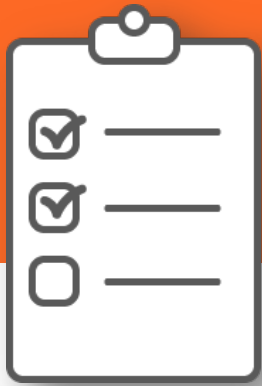
Potential outward actions:

- support local initiatives and collaborate with universities and research institutions to increase practical research for sustainability-oriented innovations
- co-invest together with other industry partners in resilient, sustainability-oriented infrastructure and supply chains
- co-develop sustainability-oriented innovations of mutual interest with suppliers and customers



"I work in the R&D department of my company and to me, personally, it is very important that the innovations we develop are used to move the world into sustainable futures, as we are running out of time to secure our survival on the planet."

Activity: potential contributions by an organization of your choice



The purpose of xyz organization is to...

In terms of SDG 9, potential contributions by xyz organization might be:

Potential inward actions:

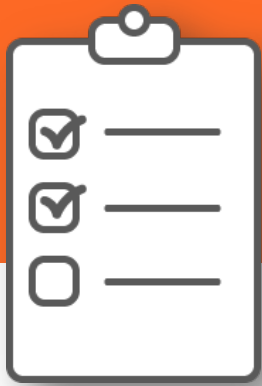
Potential outward actions:

How do inward and outward actions interact and impact each other?

Are partnerships necessary for the desired impact?



Activity: checking design of potential contributions



Returning to the opening questions:

- In which ways do the designed actions support the core purpose of xyz organization?
- In which ways do the designed actions serve the internal and external stakeholders of xyz organization?
- What balance between costs vs. benefits (or challenge vs. opportunity) can be noticed for xyz organization when addressing “innovation and infrastructure challenges”?”?
- How do the designed inward and outward actions cohere and create synergy for xyz impact?



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**Reflection and
resources
Learning activity**

Reflection and some resources

- Why is development of the industry so important for sustainability?
- What is the role of business concerning innovation?
- Why is circular economy important for sustainable futures?
- What contributions can you as an individual make to move from a linear to a circular economy?
- What might your town do to orient its infrastructure towards a sustainable world?
- What else might you change in your own household to contribute to SDG 9?

Further Infos:

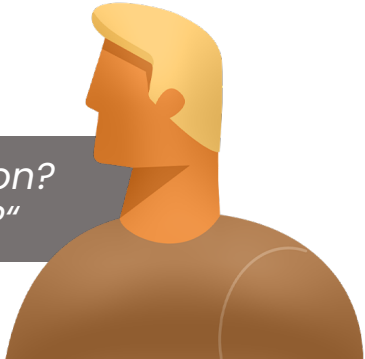
- [SDG definition of the UN](#)
- [SDG Compass on SDG 9](#)
- [Article “The hard truth about innovative cultures”](#)
- [UNOPS Infrastructure infos](#)
- [Sustainable transport in the EU](#)
- [European innovation scoreboard](#)
- [Vienna Business Agency](#)
- [Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology](#)
- [SDG Report 2021](#)



Activity: SDG journey

- > Put your SDG glasses on and observe your environment under the SDG 9 umbrella for a week and explore innovations, you can perceive daily. Take a closer look at the infrastructure around you. Is there something that has changed recently? If so, why and how? Who initiated this change?
- > If appropriate and allowed, take pictures of the found circumstances and catalogue the photos (begin making a scrapbook) – they will lead to a final assignment at the end of the series. Before you venture out, it might be a good idea to inform yourself about legal responsibilities when taking photos of people: [oesterreich.gv.at](https://www.oesterreich.gv.at) (If you are not in Austria, look for the regulations of the respective country!)

Possible resource for online scrapbook (free for classrooms and non-profits): [canva.com](https://www.canva.com)



*“Do you know anyone working in the field of innovation?
What do they do? What is the impact of their work?”*

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Sources

Slide 3:

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Slide 4:

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