9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

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

Goal 9 extends the idea of decent work to the development of infrastructure, such as transport, irrigation, energy and information and communication technology, to achieve sustainable development and community empowerment around the world. Investing in the research and development of technological progress, education and the empowerment of marginalized communities can help us achieve our environmental objectives of renewable resources and energy-efficiency.

TARGETS

- Develop sustainable and resilient infrastructure to support economic development and human well-being.

- Improve access for small business and enterprise to financial services and technical support.

- Reduce environmental impact and promote sustainable development in businesses and industries.

- Invest in research for country-specific solutions and technological improvements to economic development.

- Ensure universal access to the Internet and new technologies, particularly in developing countries.

"Never before in history has innovation offered promise of so much to so many in so short a time."

Bill Gates
American businessman and philanthropist

LEARNING OBJECTIVES

1 Learners will understand the concepts of sustainable infrastructure and industrialization.

2 Learners will understand the local, national and global challenges to achieving resilient infrastructure and industrialization.

3 Learners will be able to identify opportunities in their own culture and nation for greener and more resilient infrastructure, understanding their risks and overall benefits.

4 Learners will be able to reflect on the pitfalls of unsustainable development.

CURRICULUM CONNECTIONS

Media
How can media keep industries accountable to their social, economic and environmental impact?

Environment
What are the essential qualities of sustainable development regarding environmental protection?

Poverty, wealth and power
How can industrialization or innovation help end the poverty cycle?

Indigenous Peoples
How can infrastructure development and industrialization be more inclusive of Indigenous perspectives and rights?

Oppression and genocide
How does government corruption affect infrastructure development and industrialization?

Health and biotechnology
How can we ensure healthy working conditions amidst economic development?

Gender politics
How can we ensure spaces for women in innovative technological sectors?

Social justice and human tights
Could access to Internet become a human right? What would it look like?

Peace and conflict
How is industrial development impacted during times of conflict?

THE BIG QUESTIONS

1 Where did it begin?

- **Sustainable development** promotes the progression and development of sustainable living through sustainable infrastructure. Sustainable development of basic infrastructure, such as water, energy, transport, sanitation and information technology, is a high priority because it affects so much of our daily lives. Increased population growth and climate change have generated a need for infrastructure that is high performing, cost-effective, resource-efficient and environmentally friendly.

- Unequal access to and distribution of resources and infrastructure due to social, political and economic inequalities impacts the well-being of our population. **Overconsumption**, reliance on **nonrenewable resources** and poor protection policies fail to improve the quality of our environment in the face of economic development.

2 Why does this issue matter?

- **Communities still lack basic infrastructure**
  Basic infrastructure like roads, **information and communication technologies (ICT)**, sanitation, electrical power and water remain scarce in many developing countries. More than 2.5 billion people worldwide lack access to basic sanitation, and almost 800 million people lack access to water, many hundreds of millions of them in Sub-Saharan Africa and South Asia.[1] In addition, 1 to 1.5 billion people do not have access to reliable phone services.[2] Quality infrastructure is positively related to the achievement of social, economic and political goals.

- **We need to promote inclusive, sustainable industrialization**
  As the structure of world economies shifts to less energy-intensive industries and countries implement policies for enhanced energy efficiency, almost all regions have shown a reduction in **carbon intensity** of **gross domestic product (GDP)**. Global carbon dioxide emissions per unit of value added showed a steady decline between 1990 and 2013, a decrease of about 30 per cent.[3]

- **Small businesses need access to credit** In developing countries, small-scale industries accounted for an estimated 15 to 20 per cent of value added and 25 per cent to 30 per cent of total industrial employment in 2015.[4] However, access to financial services in those countries remains a problem.

  Globally, the credit gap for small and medium enterprises (defined as having between 5 and 99 employees) was estimated at $3.2 trillion to $3.9 trillion in 2012.[5] In emerging markets, between 45 per cent and 55 per cent of all small and medium enterprises are unserved or underserved by financial services.[6]

- **People need affordable Internet access**

  Infrastructure and economic development also rely on information and communications technology. Mobile cellular services have spread rapidly around the world, allowing people in previously unconnected areas to join the global information society. By 2015, the percentage of the population living in areas covered by mobile broadband networks stood at 69 per cent globally.[7] In rural areas, the share was only 29 per cent.[8]

3 Who and what are affected?

- **The poor**

  Infrastructure is a key element to **poverty reduction**. Investment in development can act as a catalyst for enhancing the ability for the poor to access assets like human, social, financial and natural capital. However, location, pricing and socio-political factors often reduce access to necessary infrastructure. Without roads, water, electricity and information connectivity, the poor are not able to access new markets, develop their businesses and network. Infrastructure is more than just roads and pipes, it is the capacity to use them.

- **The technologically marginalized**

  A lack of Internet access means people cannot share ideas, access financial services and ensure their safety through education and communication. At a basic level, expenditure on Internet costs around US$120 per person, per year.[9] Improving access to Internet and new technology must consider cost, connectivity, maintenance, privacy and context to bridge the digital divide.

- **Our environment**

  Building roads, dams, houses and businesses all help support a growing human population, but can have devastating impacts on our environment. They can endanger fragile habitats and species, pollute our ecosystems and reduce our **biodiversity**. Governments, industry leaders, citizens and environmental activist groups need to collaborate on innovative strategies to reduce environmental impacts and protect sensitive habitats that could be permanently damaged by these projects.

4 What needs to be done?

- Infrastructure is made up of two dimensions – the physical assets themselves and the services needed to maintain them. Project development and funding is strengthened when public and private groups work together to provide solutions. Developing new infrastructure is important, but using our existing systems more effectively and efficiently is important too.

- The development of information and communication technology (ICT), like the Internet, has developed unevenly throughout the world. This uneven development in ICT intersects with the development of other technologies, **human rights**, education, labour, democracy and tourism. However, world Internet usage is improving exponentially, with the number of Internet users in Africa alone growing 7,557 per cent between 2000 and 2017.[10]

- Improving the reach of infrastructure means improving distribution, financial access and training. Mobile phones have come a long way in supporting infrastructure, communication and information exchanges. Continuing to develop and innovate in this area will increase access and lower infrastructure barriers.

- Investing in education, ICT and our workforce is a must if we are going to increase digital literacy, decrease the gender divide and emphasize sustainable solutions to infrastructural development. This will help reduce inequalities and our negative impact on the environment.

> " It turns out that advancing equal opportunity and economic empowerment is both morally right and good economics, because discrimination, poverty and ignorance restrict growth, while investments in education, infrastructure and scientific and technological research increase it, creating more good jobs and new wealth for all of us. "
>
> **Bill Clinton**
> Former US president

CONNECTION TO THE OTHER GOALS

Investment in infrastructure and industrial development requires the use of **natural resources**. In order to make our investments sustainable, and ensure future generations the same prosperity, we need to ensure our businesses, governments and institutions understand how to minimize their impact on the environment.

Access to infrastructure must take into account the physical, economic, social, cultural, gendered, racial and ability-based barriers preventing people from participating and benefiting from this development.

Solving issues in access to infrastructure requires a systems-level approach. We need to understand the interconnected reality of the big issues facing our planet and population, such as the role poverty plays in determining access to good infrastructure.

Consequences of Inaction

- The cost of our inaction is steep. Given the role of infrastructure and industrial development as core drivers of a global development agenda to eradicate poverty and advance sustainable development, failure to improve inclusive, reliable, and sustainable development will make ending poverty more difficult.

- Failing to improve infrastructure and promote technological innovation could translate into poor health care, inadequate sanitation and limited access to education.

- Failing to improve and address the sustainability of our businesses, governments, policies and habits will sacrifice our environment for an uncertain future.

REFLECTION AND ACTION QUESTIONS

1   How do you feel about the issue now that you know more about it?

2   How might this issue have been prevented? What could have been done differently?

3   How has this problem changed over time? Where do you see it going in the future?

4   What questions do you still have?

" To get away from poverty, you need several things at the same time: school, health, and infrastructure—those are the public investments. And on the other side, you need market opportunities, information, employment and human rights. "

Hans Rosling
Swedish physician and academic

RESOURCES

How to take action

- **Encourage collaboration.** Look for ways stakeholders like **non-governmental organizations (NGOs)**, governments, businesses and community members can help solve problems. Look for inclusive, resilient and sustainable solutions that benefit as many people as possible. You can challenge projects and policies that you don't think are fair through your voice on social media, print media and demonstrations. You can also use your vote and your dollar to influence policies and products that you think are doing a good job or need to improve.

- **Speak up and out.** Ensuring our right to communicate and connect is essential to our individual, economic and political prosperity. However, many groups such as people of colour, immigrants, minorities, women and LGBTQ groups, are under attack from censorship and bullying. In order to benefit from Internet access, it has to be a safe space for everyone. Speak out against bullies and speak up over censorship of **marginalized** groups.

- **Expand your understanding.** Anyone can use their creativity to problem solve with innovative solutions. Set out to learn some new tech skills and involve yourself in an innovative community. Look for ways to apply your innovative ideas to better your community and improve the capacity of marginalized groups. Innovation comes from collaboration, so look for ways to learn, share and think critically with people in your community and on the other side of the world.

- **Support projects that promote sustainable growth and protect the environment**. Do your research before raising and donating funds. Get involved in local industry and infrastructure decisions and speak up about future developments or address existing projects and help make them more sustainable.

- **Let your dollar do the work.** Make ethical decisions while you're shopping to make sure your dollars are supporting producers who protect the environment and receive a fair wage. One way to do this is to buy **fair trade** items or look for B-Corp Certified products.[11] A fair trade item ensures your dollars are supporting producers who protect the environment and receive a fair wage. For more information and resources on fair trade, please see SDG 12.

Educational resources

- The World's Largest Lesson page for Goal 9 has downloadable comics, posters, and lesson plans here, including this one on Food Innovations: Investigations in Science. Designed for age 9 to 14, this lesson plan encourages students to consider the impact of their daily food choices on the Global Goals and think about innovations in food systems.

- UNESCO has developed a strong collection of resources to help teachers understand and educate students on the principles of sustainable development.

- The Manitoba Ministry of Education has a wealth of resources for teachers to develop an interdisciplinary approach to instruct sustainable development.

- Learn more about sanitation infrastructure and how access to clean water changes lives. Explore these water lesson plans on issues including water scarcity, the effects of dirty and unsafe water and the impacts that lack of proper sanitation and hygiene can have in a community.

- Consider using Design Thinking in your classroom to help your students be innovators. There is a lot of great information online, and a good place to start is this Toolkit to Explore Design Thinking. For some design thinking projects and challenges, check out this list of ideas and lesson plans.

> "Imagination is not only the uniquely human capacity to envision that which is not, and therefore the fount of all invention and innovation.
>
> In its arguably most transformative and revelatory capacity, it is the power that enables us to empathize with humans whose experiences we have never shared. "
>
> **J.K. Rowling**
> British author

CASE STUDIES

1 USAID

In Afghanistan, only 30 per cent of the population has access to reliable sources of electricity. Through the support of USAID, a newly commercialized national electric company in Kabul was able to reduce energy loss from 60 per cent to 35 per cent, caused by poor billing, illegal connections and inefficiencies.[12] In the process, they were able to improve the sustainability of long term provision of electricity for their customers.[13]

2 EcoCash and M-Pesa

Developing **mobile infrastructure** is just as important to growing economies as physical infrastructure. Companies like EcoCash and M-Pesa in Zimbabwe and Kenya offer SMS-based money transfer services. Investments in African companies supporting financial services through mobile phones have increased access for customers previously to baking services and their money. M-Pesa is moving over $24 million in transactions each day.[14]

3 Medellín

In 2004, the Colombian city of Medellín began constructing gondolas to help improve transportation to and from low income neighbourhoods in the city. Investing in resilient, innovative and sustainable transportation saved residents time and money commuting downtown for work. Improved infrastructure helped increase security by adding lighting, presence, and attention to formerly high crime areas.

4 Mennonite Economic Development Associates

Mennonite Economic Development Associates is working to improve the crop yields and farmer incomes of rural farmers in Peru using organic biofertilizer. Use of organic biofertilizers has increased coffee and cocoa yields by up to 50 per cent in Peru. This project assists local cooperative Divisoria to scale up commercial production and sale of organic biofertilizer to 850 coffee and cocoa farmers in the regions of Huanuco, Ucayili and San Martin.

5 Engineers Without Borders

In partnership with Engineers Without Borders, 150 Ugandan entrepreneurs piloted a mobile financial record keeping app for small businesses called TrackApp. This mobile financial record-keeping application is designed for use by small businesses around the world. Currently, 150 Ugandan entrepreneurs are piloting TrackApp to empower themselves and their businesses to make evidence-based decisions, leverage financial records, generate income and provide better goods and services in their local economy.

6 iDE Canada

iDE Canada is working in Ethiopia to help 7,000 farmers earn income from dry season farming by providing training to local entrepreneurs and assisting farmers in setting up viable sustainable markets for their products. This will help sustain livelihoods and support business relationships in the area

End notes

[1] https://sustainabledevelopment.un.org/sdg9

[2] https://sustainabledevelopment.un.org/sdg9

[3] https://sustainabledevelopment.un.org/sdg9

[4] http://www.fresh-partners.org/sdg-9---industry-innovation--infrastructure.html

[5] https://unstats.un.org/sdgs/files/report/2016/secretary-general-sdg-report-2016--EN.pdf

[6] https://sustainabledevelopment.un.org/sdg9

[7] https://unstats.un.org/sdgs/report/2016/goal-09/

[8] https://sustainabledevelopment.un.org/sdg9

[9] https://psu.pb.unizin.org/ist110/chapter/9-3-the-digital-divide/

[10] http://www.internetworldstats.com/stats.htm

[11] http://www.fairtrademanitoba.ca/

[12] https://www.usaid.gov/afghanistan/infrastructure

[13] https://www.youtube.com/watch?v=e274xwYwULs

[14] http://www.un.org/africarenewal/magazine/april-2014/internet-access-no-longer-luxury