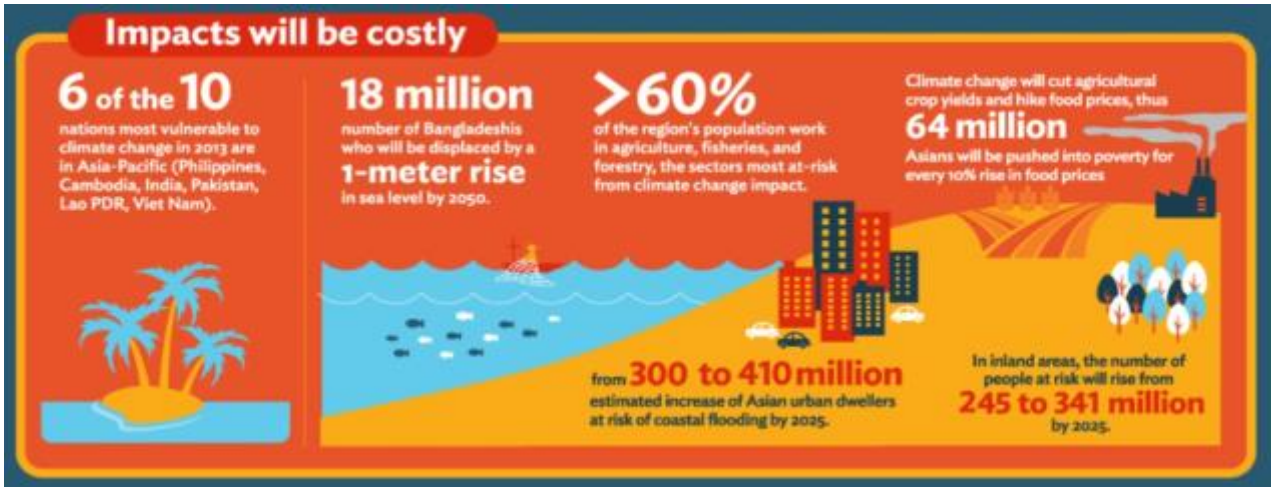
Issue Paper: Asia-Pacific Bureau Climate Change

November 2017

The Issues

The Asia-Pacific region is the most vulnerable in the world to the impact of climate change[1]

Higher temperatures, sea level rise and extreme weather events linked to climate change are harming economies, natural and physical assets, and compounding developmental challenges, including poverty, food and energy security, and health.



Source: Asian Development Bank, "Climate Change in Asia and the Pacific: Infographic," 6 October 2015.

More frequent extreme weather events are likely to result in increases in the loss of lives, infrastructure and properties. On an annual average basis, the cost of disasters to the region has

[1] United Nations Economic and Social Commission for Asia and the Pacific, "Economic impacts of climate change in Asia-Pacific to be highlighted at global UN forum," Press Release, 11 November 2016, http://www.unescap.org/news/economic-impacts-climate-change-asia-pacific-be-highlighted-global-un-forum; and Dawn, "Asia-Pacific countries most vulnerable to climate change, warns minister," 18 May 2015, https://www.dawn.com/news/1182623.

increased from USD1.8 billion during the 1970s to USD73.8 billion between 2004 and 2013, a forty-fold increase.[2]

Without climate-oriented development, climate change could force more than 100 million people from the region into extreme poverty by 2030, wiping out development gains achieved over the last decades.[3]

The Asia-Pacific region is extremely vulnerable to climate change and the United Nations has identified **climate change adaptation** as one of the five priority areas for climate change response in the region, to prepare for the effects of climate change that are expected in the coming decades. The two critical areas for climate change adaptation in the region are agriculture and urbanisation.[4]

The Asia-Pacific region also contributes over half of the world's total greenhouse gas emissions[5]

In addition to being vulnerable to climate change, the region is a major contributor to climate change. It already accounts for over half of global greenhouse gas emissions, and the high-growth path on which many of the region's economies find themselves means that this contribution will grow unless there are significant policy interventions.

Climate change mitigation refers to efforts to reduce or prevent emission of greenhouse gases. Mitigation can mean using new technologies and renewable energies, increasing energy efficiency, or changing management practices or consumer behaviour.

Information and communications technology (ICT) is essential to combating climate change (see section B.2 below). At the same time, the sector is consuming a tremendous amount of energy to manufacture, distribute and power devices, and to establish and maintain data centres and related infrastructural needs.

Studies are showing that the ICT sector is using up almost a tenth of the world's electricity, and this is likely to increase 7% annually as more people and "things" get connected, and as data usage surges.[6] Moreover, Asia as a hub for the manufacture of smartphones is growing with manufacturers from India, Indonesia, Philippines, Thailand and Viet Nam joining the established brands from China, Japan and Republic of Korea.[7] This means greater energy usage and associated greenhouse gas emissions, as many of these countries are heavily dependent on coal and other fossil fuels.

The environmental and health impact of e-waste need to be addressed

---

[2] See Issues Paper on Disaster Risk Reduction at http://www.internetsociety.org/ridd/apac/sites/internetsociety.org.ridd/files/uploads/sessions/RIDD-Issues-Package-Final.pdf.

[3] United Nations Economic and Social Commission for Asia and the Pacific, *The Economics of Climate Change in the Asia-Pacific Region* (Bangkok, 2017), http://www.unescap.org/sites/default/files/The Economics of Climate Change in the Asia-Pacific region.pdf.

[4] Ibid.

[5] United Nations Economic and Social Commission for Asia and the Pacific, *Economic and Social Survey of Asia and the Pacific 2017* (Bangkok, 2017), http://www.unescap.org/sites/default/files/publications/Survey%202017-Final.pdf.

[6] Mark P. Mills, "The Cloud Begins with Coal: Big Data, Big Networks, Big Infrastructure and Big Power - An Overview of the Electricity Used by the Global Digital Ecosystem," August 2013, https://www.tech-pundit.com/wp-content/uploads/2013/07/Cloud_Begins_With_Coal.pdf?c761ac; and Greenpeace, *Clicking Clean: Who is Winning the Race to Build a Green Internet?* (Washington, D.C., 2017), http://www.clickclean.org/international/en/.

[7] GSMA, "The Mobile Economy: Asia Pacific 2017," 2017, http://www.gsma.com/mobileeconomy/asiapacific/.

Almost all e-waste contains hazardous toxins, many of which are known human carcinogens. Moreover, many of these toxins are non-biodegradable, which increases the length of exposure risk.

Most environmental damage and health impact related to e-waste arise from improper collection and treatment approaches.[8] For example, the incineration of e-waste leads to greenhouse gas emissions and mercury emissions, and the toxic chemicals can leak and contaminate air, soil and water systems. About 50-80% of the e-waste is shipped to developing countries like China and India,[9] and those who bear the brunt of the harmful effects of e-waste are the informal waste workers and those living around the e-waste sites, due to the lack of a system for the safe handling of toxic materials in these countries.

The Opportunities

Most Asia-Pacific countries have ratified the Paris Agreement and are committed to combating climate change

Most countries in the Asia-Pacific region have ratified the Paris Agreement–an agreement negotiated at the 21st Conference of the Parties of the United Nations Framework Convention on Climate Change in Paris, adopted by consensus in 2015, and went into effect on 4 November 2016. Bhutan, Iran, Myanmar and Timor-Leste have signed but not ratified the Paris Agreement.[10]

Each individual country decides the measures it will commit to in order to achieve the goals set in the Paris Agreement, also called the Nationally Determined Contributions (NDCs). A study estimates that even if all the NDCs are met, the world will still be on course for an average 2.7^{O}C temperature rise, well above the desired limit of 1.5^{O}C.[11] However, the same study is optimistic that ICT can speed up progress towards achieving climate change-related targets.

The Internet and ICT systems can accelerate climate change mitigation and adaptation

A study by the Global e-Sustainability Initiative and Accenture estimates that digital solutions, including smart agriculture, smart building, smart energy, smart manufacturing and smart mobility, can cut over 12 gigatonnes of carbon dioxide (CO_2) emissions across the global economy by 2030. That will be around 20% of total global CO_2 emissions in 2030.[12]

---

[8] United Nations University, *The Global E-Waste Monitor 2014* (Bonn, 2015), http://i.unu.edu/media/unu.edu/news/52624/UNU-1stGlobal-E-Waste-Monitor-2014-small.pdf.

[9] Cited in Lucy McAllister, Amanda Magee and Benjamin Hale, "Women, E-Waste, and Technological Solutions to Climate Change," *Health and Human Rights Journal*, Vol. 16, No. 1 (June 2014), https://cdn2.sph.harvard.edu/wp-content/uploads/sites/13/2014/06/McAllister1.pdf.

[10] United Nations Framework Convention on Climate Change, "Paris Agreement - Status of Ratification," accessed on 20 May 2017, http://unfccc.int/paris_agreement/items/9444.php.

[11] Climate Action Tracker cited in Global e-Sustainability Initiative and Accenture, "#SystemTransformation: How Digital Solutions will Drive Progress Towards the Sustainable Development Goals: Summary Report," http://systemtransformation-sdg.gesi.org/160608_GeSI_SystemTransformation.pdf.

[12] Global e-Sustainability Initiative and Accenture, "#SystemTransformation: How Digital Solutions will Drive Progress Towards the Sustainable Development Goals: Summary Report," http://systemtransformation-sdg.gesi.org/160608_GeSI_SystemTransformation.pdf.

Another study by Ericsson concludes that ICT, particularly the Internet of Things (IoT),[13] can help reduce greenhouse gas emissions in different industrial sectors by up to 15% by 2030.[14]

An example from India of enhanced efficiency to better adapt to climate change and rising disaster risks is given below.

ICT system enhances disaster monitoring and communication in India[15]

The Karnataka State Natural Disaster Monitoring Centre provides real-time weather information, forecasts, early warnings, and advisories about natural disasters in the state. The organisation deployed an ICT system that aggregates information coming from 6,000 rain gauges and more than 750 weather stations that transmit data every 15 minutes. This automated a system that was largely manual, and it now provides real-time visualisation. The time it takes to generate reports decreased from 20 hours to 30 minutes. The web-based system allows public users to query and view the weather database.

Generally, the use of the Internet and ICT systems can:

- Collect, monitor and manage the knowledge base on greenhouse gas emissions and climate-related risks.
- Better monitor and manage disaster risks.
- Facilitate multi-sector and multi-stakeholder engagements at local, national, regional and global levels.
- Promote awareness, knowledge exchange, technical cooperation and capacity building.
- Improve energy efficiency in cities, buildings, transportation, and the production of goods and services through smart applications (e.g., smart cities, smart buildings, smart grids, smart transportation and smart manufacturing).
- Enable farmers, fishers and foresters to access information and choose among diverse methods of achieving sustainable agricultural production.
- Dematerialise or substitute high-carbon products and activities with low-carbon alternatives, e.g., replacing face-to-face meetings with videoconferencing, paper with e-documents, and the need for physical presence at a government office with e-government services.

Some key principles for deploying ICT to combat climate change include:[16]

- Appointing a key stakeholder with multi-disciplinary skills (either within government or endorsed by government) capable of delivering a holistic vision and leading collaborations at the country level.
- Promoting technology investment in open and scalable systems, using standards-based solutions.
- Complying with privacy[17] and security best practices.
- Engaging in dialogue with multiple stakeholders, including end users, that goes beyond arguments of efficiency, and questions the values and rights behind the application of the technologies.

[13] See Issues Paper on Internet of Things.

[14] Ericsson, "ICT and the Low Carbon Economy: Extract from the Ericsson Mobility Report," November 2015, https://www.ericsson.com/res/docs/2015/mobility-report/emr-nov-2015-ict-and-the-low-carbon-economy.pdf.

[15] Jack Dangermond, "Geographic information system driving digital transformation in India," *Livemint*, 19 May 2017, http://www.livemint.com/Industry/bXjtTHHuWOTBZ2CZIWxEOJ/Geographic-information-system-driving-digital-transformation.html.

[16] GSMA, "Maximising the Smart Cities Opportunity: Recommendations for Asia-Pacific Policymakers," 2017, https://www.gsma.com/iot/wp-content/uploads/2017/05/Smart-Cities-Report-web.pdf.

[17] See Issues Paper on Online Privacy.

- Making data available to promote and stimulate innovation.

These key principles are being applied in Hong Kong's smart city and smart transportation initiatives

Hong Kong's smart city and smart transportation development

Hong Kong has committed to reducing total greenhouse gas emissions by 26-36% by 2030. Its Climate Action Plan 2030+[18] incorporates the use of smart technologies to mitigate and adapt to climate change, and its forthcoming Smart City Blueprint[19] envisions an increased use of sensors, IoT and big data analytics to achieve the targets set in the Climate Change Action Plan 2030+. The Hong Kong government's Chief Information Officer is responsible for leading the various smart initiatives, and has been engaging stakeholders and citizens in formulating the Smart City Blueprint.

In Hong Kong, buildings and vehicles are the main sources of greenhouse gas emissions, and thus, many initiatives have focused on making buildings and transportation systems smarter through the use of ICT. Hong Kong is also leveraging ICT to better prepare for extreme weather events and rising sea levels caused by climate change.

As part of Hong Kong's smart transportation development, the mass transit railway and the tramway have opened up their transport data to the public. Ride sharing company, Uber has also opened up its transport data. The Citymapper app has made use of all the open transport data to help users plan their routes and modes of transport to reach their destinations in the shortest time.[20]
More broadly, to stimulate innovation, the Government of Hong Kong has been building its open data portal that has about 700 datasets from more than 50 government bureaus and departments, and it aims to make 500-1,000 APIs available by the end of 2017.[21]

Smart city initiatives in the region recognise the climate change challenges and are working to address them

In 2016, 49% of the region's 4.3 billion people live in urban areas, and they generate more than 70% of the world's greenhouse gas emissions.[22]

City leaders are coming together to act on global issues such as climate change. Networks of collaborating cities, like the Global Parliament of Mayors, the 100 Resilient Cities, the C40 Cities Climate Leadership Group and the ASEAN Cities Mayors Forum, are using the Internet, particularly social media,[23] to raise awareness and advocate for change, as well as exchange knowledge and experience.

[18] Hong Kong's Environment Bureau, "Hong Kong's Climate Action Plan 2030+," January 2017, https://www.climateready.gov.hk/.

[19] Smart City HK, https://www.smartcity.gov.hk/.

[20] Nancy Ho, "Transportation Development Trends in the Big Data Era in HK," *Computerworld Hong Kong*, 20 March 2017, https://www.enterpriseinnovation.net/article/transportation-development-trends-big-data-era-hk-73825954.

[21] Sheila Lam, "Previewing OGCIO's smart city blueprint," *Computerworld Hong Kong*, 21 April 2017, http://cw.com.hk/news/previewing-ogcios-smart-city-blueprint.

[22] United Nations Economic and Social Commission for Asia and the Pacific, *The Economics of Climate Change in the Asia-Pacific Region* (Bangkok, 2017), http://www.unescap.org/sites/default/files/The Economics of Climate Change in the Asia-Pacific region.pdf.

[23] See Issues Paper on Social Media.

An Economist Intelligence Unit survey of 2,000 citizens in 20 Asia-Pacific cities found that smart city initiatives are rising in importance, with 82% of the respondents saying their city should create more of them. They cited improving the environment as the top benefit of smart cities.[24] This indicates a strong awareness of how urban living contributes to environmental degradation, as well as expectation that smart cities will help to address this issue.

Recently, many smart city initiatives have sprouted in the Asia-Pacific region.[25] The Wireless Broadband Alliance defines smart city as the use of ICT to connect people, processes and assets in order to create a more efficient and sustainable city, and improve the lives of citizens, businesses and city agencies.[26] For example, wireless sensor networks coupled with big data and analytics technologies provide insights to improve operations and policies. But, smart cities is not just about the implementation of various technologies. It is about the use of the technologies to transform the way in which cities are managed to address social, economic and environmental challenges. Currently, different countries have different visions of what smart cities entail, and are therefore implementing different types of programmes.

The Internet and ICT systems can enhance energy efficiency and renewable energy measures

Rising greenhouse gas emissions from fossil fuel use, and consequently, local air pollution and its negative impact on health, mean that cleaner energy is needed to displace traditional carbon-based sources (i.e., coal, oil and natural gas). In addition, the Asia-Pacific region still has not achieved comprehensive energy access, with over 400 million people in the region without access to electricity. More efficient and renewable energy, including distributed systems are central to the solution.

A serious concern is the burning of solid biomass in inefficient stoves by some three billion people around the world, accounting for 40% of global black carbon emissions–half of it from rural India. Exposure to these particles indoors is harmful to health and is estimated to be responsible for 3.5 million deaths every year.[27] In a pilot study conducted in India, solar-powered wireless sensing systems were installed in 4,000 households to monitor the usage of improved, more efficient cook stoves and test the feasibility of sensor-enabled climate financing. Users have near real-time access to consumption figures and receive cash payments for using the cook stoves, as an incentive.[28]

In the region, innovative business models developed in partnership between energy and telecommunications companies are offering energy services as well as their financing through mobile phones.[29] An example is the pay-as-you-go solar home systems that customers in countries

[24] The Economist Intelligence Unit, "Startup My City: Smart and Sustainable Cities in Asia," 2016, http://startupmycity.economist.com/wp-content/uploads/2017/01/EIU-Startup-My-City-Briefing-Paper.pdf.

[25] Telecomasia.net, "Smart city development now a global phenomenon," 18 May 2017, https://www.telecomasia.net/content/smart-city-development-now-global-phenomenon.

[26] Wireless Broadband Alliance, "Connected City Blueprint," 15 December 2016, http://www.wballiance.com/wp-content/uploads/2016/12/Connected-City-Blueprint-V1.pdf.

[27] Tara Ramanathan et al., "Wireless sensors linked to climate financing for globally affordable clean cooking," *Nature Climate Change*, Vol. 7 (January 2017), https://www.nature.com/articles/nclimate3141.epdf.

[28] Ibid.

[29] United Nations Economic and Social Commission for Asia and the Pacific, *The Economics of Climate Change in the Asia-Pacific Region* (Bangkok, 2017), http://www.unescap.org/sites/default/files/The Economics of Climate Change in the Asia-Pacific region.pdf.

like Cambodia,[30] India[31] and Pakistan[32] can remotely control and monitor through machine-to-machine (M2M) connectivity, and pay for using mobile money.

Globally, stakeholders are beginning to explore the potential of IoT to promote energy efficiency and the uptake of renewable energy sources. In the past, it was thought that renewable energy sources could not comprise more than 10% of total energy production because of their intermittent availability–this figure has now gone up to 80%, thanks in large part to IoT enabling real-time monitoring and adjustments of energy production and usage.[33]

Google has recently started using artificial intelligence to manage its data centres, with claims of a 15% decrease in total energy use, and 40% reduction in energy use for cooling.[34]

Major companies in the ICT sector are stepping up their efforts to reduce their own greenhouse gas emissions

Major companies such as Apple, Facebook and Google were leaders in committing to the adoption of 100% renewable energy about five years ago. Since then, about a dozen companies have followed suit, including the Korean Internet company, Naver.

Source: Greenpeace, Clicking Clean: Who is Winning the Race to Build a Green Internet? (Washington, D.C., 2017)

However, Greenpeace reported that the lack of access to renewable energy from monopoly utilities in the region is a major obstacle to creating an Internet powered by renewable energy sources, and calls for advocacy around greater access to renewable energy.

For example, in the Republic of Korea, the monopoly electricity provider, KEPCO, has a generation mix with only 1.1% renewable electricity, and 58% fossil fuel. Due to the monopoly utility, it is not possible to purchase renewable energy using the market mechanism. Nevertheless,

---

[30] GSMA, "Mobile for Development Utilities: Kamworks Introducing GSM-enabled PAYG Solar in Cambodia," May 2016, http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/05/M4D-Utilities-Grantee-Case-Study-Kamworks.pdf.

[31] Simpa, http://simpanetworks.com/.

[32] GSMA, "Mobile for Development Utilities: EcoEnergyFinance Distribution of Solar Pay-as-you-go in Pakistan," May 2016, http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/05/M4D-Utilities-EcoEnergyFinance-Distribution-of-Solar-Pay-as-you-go-in-Pakistan.pdf.

[33] David Kirkpatrick and Diane Regas, "How the Internet of Things Will Fight Climate Change," *Techonomy*, 22 November 2016, http://techonomy.com/2016/11/how-the-internet-of-things-will-fight-climate-change/.

[34] UN Climate Change Newsroom, "ICT Helping Tackle Climate Change: Could Help Cut Global Emissions 20% by 2030," 12 August 2016, http://newsroom.unfccc.int/unfccc-newsroom/ict-sector-helping-to-tackle-climate-change/.

the public's demand for clean energy has prompted the provincial government in Gangwon Province to build the first 100% renewably powered data centre complex in Chuncheon City.[35]

Alignment with the SDGs

The Internet and ICTs can make significant contributions to Sustainable Development Goal (SDG) 13, which focuses on taking urgent action to combat climate change, as well as to SDGs 2, 7, 8, 9 and 11 that are linked to addressing climate change challenges.[36]

SDG	SDG Targets Related to Climate Change	Most Powerful Digital Solutions	Positive Impact of Digital Solutions
	2.4 Ensure sustainable food production.	**Smart Agriculture.** For example, optimised farm management and automated irrigation systems; precision agriculture, including M2M/IoT, soil sensors and satellites and integrated real-time weather information; traceability and tracking systems.	Increases agricultural productivity while reducing the need for scarce inputs such as water. **Crop yield increase of >900 kg/ha in 2030.**
	7.2 Increase share of renewable energy in the global energy mix. 7.3 Double the global rate of improvement in energy efficiency. 7.b Expand infrastructure and upgrade technology for supplying modern and sustainable energy.	**Smart Energy.** For example, smart grid, smart appliances, energy storage, predictive analytics, sensors, demand response technology.	Improves energy efficiency and access to more affordable energy, and supports the increased share of renewable energies in energy mix. **>1.3 billion MWh savings in 2030.**
	8.4 Improve global resource efficiency and decouple	**E-work.** For example, augmented reality, cloud-based	Boosts growth and helps decoupling it from resource consumption.

[35] Greenpeace, *Clicking Clean: Who is Winning the Race to Build a Green Internet?* (Washington, D.C., 2017), http://www.clickclean.org/international/en/.

[36] Table source: Global e-Sustainability Initiative and Accenture, "#SystemTransformation: How Digital Solutions will Drive Progress Towards the Sustainable Development Goals: Summary Report," http://systemtransformation-sdg.gesi.org/160608_GeSI_SystemTransformation.pdf.

	economic growth from environmental degradation.	platforms, telecommuting, virtual business meetings.	**E-work could save 0.4 gigatonnes of greenhouse gas emissions.**
	9.2 Promote inclusive and sustainable industrialisation.	**Smart Manufacturing.** For example, industrial IoT, 3-D printing, cyber-physical systems, data analytics & cloud computing, drones & robotics, embedded system production technology. **Smart Logistics.** For example, IoT/connected vehicles, load units, products and machines; augmented reality and wearable technologies; commercial unmanned aerial vehicles; digital warehouses; and optimised fleet and route management.	Boosts efficient and innovative supply, production and delivery of goods. **Smart manufacturing and smart logistics can collectively enable USD 982 billion of cost savings from improved efficiencies while delivering energy savings of 5.3 billion MWh and fuel savings of 267 billion litres.**
	11.b Increase the number of cities with policies towards, resource efficiency, mitigation and adaptation to climate change, resilience to disasters.	**Smart Building.** For example, alarm management and automation, big data analytics and energy management, smart metering, IoT/sensors, monitoring, detection and diagnosis technologies. **Smart Mobility.** For example, mobile ride sharing, e-mobility, driverless transportation, intermodality, connected infrastructure/IoT.	Reduces resource consumption, improves energy efficiency and lowers air pollution. **Around 5% CO_2 emissions savings in 2030 from smart building and smart city mobility alone.**
	13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters.	All digital solutions including smart agriculture, smart building, smart energy, smart logistics, smart manufacturing, smart mobility, etc.	Enables greenhouse gas emissions reduction and drives market transformation for renewables. **Around 20% of global CO_2 emissions can be cut by 2030.**

Questions to Think About

- In the context of a widening digital divide, what is the regional strategy for ensuring that efforts to mitigate and adapt to climate change are able to leverage digital technologies? On the other side of the coin, how do we minimise the negative effects of e-waste on the environment and the climate?
- What is the most suitable regional forum to engage in dialogue and knowledge sharing on ICT innovations and new business models that could be replicated or scaled up to achieve climate change-related targets? How can we involve a wide range of relevant stakeholders on these issues?
- What are the mechanisms to ensure that the needs of local communities and marginalised groups are
- voiced and considered in the technical domain of ICT, and the scientific domain of climate change?