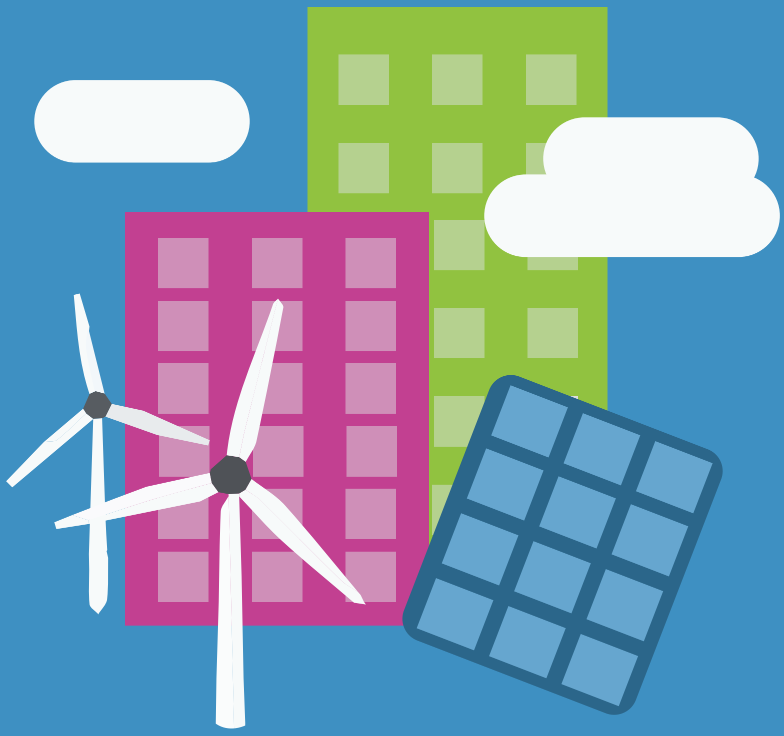
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION



BERKELEY MODEL UNITED NATIONS

WELCOME LETTER

Hello Everyone! My name is Vikas Sharma and I will be your head chair for BMUN 67. I'm a sophomore majoring in computer science and economics. I'm originally from Michigan so in my free time, I like to visit as much of California as I can. Aside from traveling through the area, I love football, dancing, and finding new places to eat. I'm really interested in advanced technology's ability to impact urban life (you may have guessed) and healthcare. I'm excited to meet you all and wish you the best of luck as you research.

Tal Stoler is a junior at Cal studying economics, and in her second year in BMUN. In her free time, she loves cooking, working out, and binge-watching Netflix. She also loves going to Target, because it's always just the best time ever. And of course, she also love doggo-spotting (both virtually and in real life). Besides being in MUN, Tal is also part of the Berkeley Student Food Collective and Suitcase Clinic. Tal is really interested in food systems, health, and how those factors play into international development. If you're interested in these topics too (or if you just think she's an odd and spectacular human), feel free to email her.

Emma Lautanen is in her last year at Cal, majoring in Political Science. After she graduates, she plans on delaying her entrance in the adult world by pursuing law school, preferably in the field of environmental law. Emma loves the outdoors and spends much of her free time hiking and backpacking in the Sierra Nevada. Emma loves to run, has run two marathons, (in Ireland and Switzerland) and hopes to continue this incredibly painful hobby far into the future (as long as her knee joints don't give out). Emma also loves dogs, she recently got a puppy last January and the separation anxiety has been tough. Emma is so incredibly excited to meet all of you and looks forward to a wonderful debate!

Jin Wei Zhang is currently a freshman intended on majoring in computer science and will be serving as a vice-chair for UNIDO. Hailing from Vancouver, Canada, Jin Wei has been involved in MUN for over 2 years, delegating and serving as his high school MUN club's coach. Outside of MUN, some of his hobbies include binge-watching Brooklyn 99, chilling out to hip hop, indie, or alternative music, and browsing dank memes. Jin Wei is excited for BMUN

67 and can’t wait to meet his delegates!

Vikas Sharma

Head Chair, United Nations Industrial Development Organization

Berkeley Model United Nations Sixty-Seventh Session

TOPIC A: EFFICIENT ENERGY CAPTURE, STORAGE, AND TRANSMISSION

HISTORICAL BACKGROUND

Energy in the world has evolved over centuries, but the most notable shift in the types global energy first occurred during the industrialization of Europe. In the mid-1700s, the steam engine was made increasingly efficient (Yergin et al.). These advancements made transportation commercially possible, and through continuous improvements, coal was 50% of the world's primary energy supply by 1900. At the time, coal was seen as extremely effective due to its abundance, affordability, and reliability. It wasn't until much later that people became aware of the cons of using coal, including steep environmental repercussions and high amounts of waste.

Due to a surge in demand for lighting during the late 1800s, people sought whale oil, as it provided the best source of illumination (Yergin et al.). However, due to its exorbitant price, many people searched for a sustainable substitute, which they found in petroleum. Soon after being discovered, oil became an international business and quickly prevailed over coal for a multitude of reasons. After the creation of automobiles, oil quickly became the most widely used energy source as it had an extremely high energy density. Furthermore, the limited supply of oil coupled with the ease of transport made it an extremely efficient energy. These advancements in transportation allowed countries with an abundance of oil to maximize profit eventually forming organizations such as OPEC (Organization of Petroleum Exporting Countries).

Accessible technologies built to mine oil, such as pumpjacks and gravimeters, as well as oil's comparatively cheap production costs have led to oil being the world's dominant energy source. However, as research developed, it became evident that the mass dependency on oil had many negatives. It resulted in the large scale emission of carbon dioxide, sulphur dioxide, and other greenhouse gases that are extremely harmful to the global environment in high quantities. Moreover, it is widely accepted that there is a finite supply of oil and the high dependency on it is simply prolonging a mass energy shift.

After natural gas, a cheaper and cleaner alternative to coal, was discovered in the 1820s, fossil fuels truly began to dominate the energy market. At first, it was very difficult to commercialize, and due to inefficiency in transportation, much of the gas was simply left underground and undeveloped. However, after the development of liquified natural gas (LNG), a natural gas that is compressed and liquefied, allowing it to be transported via tanker and then re-gasified, the production of natural gas became significantly more effective and efficient. Natural gas allowed electricity to become a growing part of commercial life, changing the way energy was viewed (Yergin et al.).

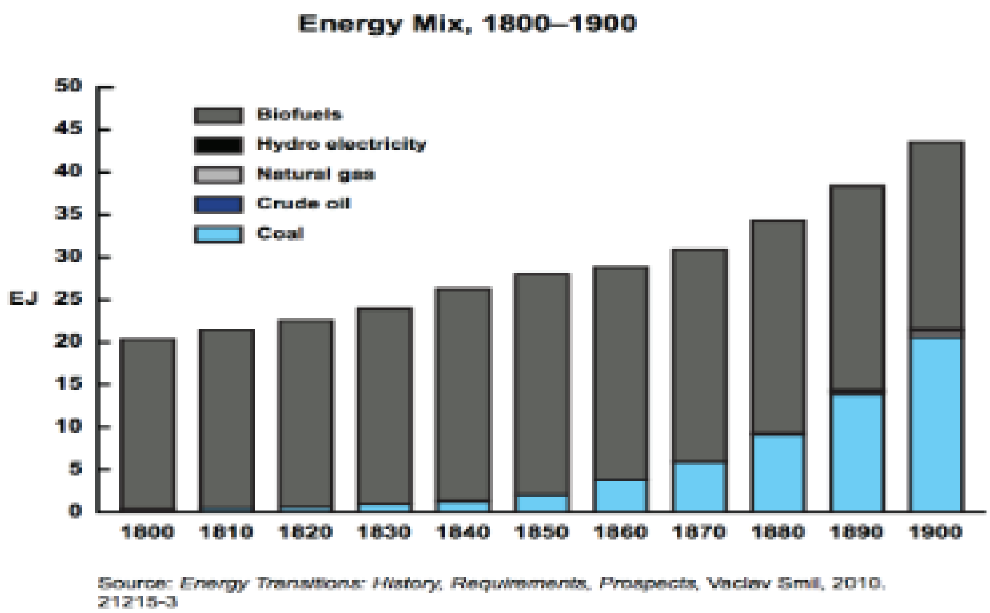


Figure 1: Energy mix from 1800-1900 (Yergin et al)

When coal fired plants rose in prominence in the early 1800s, the demand for electricity resulted in efforts to generate electricity using hydropower. The first small scale hydroelectric project was developed in England and compounded with growing demand and technological advancements there was a sharp increase in hydro projects. In the 1930s, countries such as the Soviet Union and the United States pushed for greater hydroelectric projects, resulting in massive hydro stations such as the Hoover Dam and the Grand Coulee Dam (Yergin et al.). Hydroelectric energy rapidly became a viable energy source, amassing large portions of overall energy makeups in many countries. As hydroelectricity became more developed, international attention shifted to making it more efficient, resulting in the development of a more powerful, predictable form of energy: tidal energy. The development of ocean energy will undergo a highly substantial increase to become a major source of electricity supply by 2050. This is in large part due to growing belief in the growing belief in tidal energy's feasibility (Segura et al.).

As the focus on sustainable energy grows, the inefficiency of numerous sustainable and fossil fuel energy sources has become more and more obvious. Energy sources such as solar energy and wind energy have extremely poor energy conversion ratios, and this, coupled with human waste, results in the waste of 20-25% of total energy. As the amount of wasted energy rises, many scholars have come to the conclusion that sustainable energy and energy efficiency are simply two sides of the same coin, both equally necessary. Due to the mass efficiency of numerous sustainable energy technologies, research and significant developments have been made in energy fields to maximize efficiency, such as orbiting solar arrays, tidal energy, and perhaps most importantly, smart grids. The table below highlights the 3 main sectors affected by a change in energy efficiency as well as economic, social, and political outcomes:

Energy Efficiency Impact	Economic Outcomes	Social Outcomes	Environmental Outcomes
The Business	• Profitability and productivity improvements can be up to 2.5 times of energy cost savings. • Technical energy efficiency improvements new processes and technology • Improved energy security. • Improved competitiveness. • Technology spill over & supply chain improvements. • New business opportunities.	• Safer working conditions. • Improved job satisfaction, better working conditions.	• Reduced local pollution air and water emissions. • Water conservation. • Reduced physical waste.
National Economy and Society	• Macroeconomic gains. • Increased employment. • Increased tax revenue from higher value services • Economic restructuring to higher value activities • Improved global competitiveness.	• Improved health from lower local pollution.	• Reduced local pollution, air and water emissions. • Water conservation. • Reduced physical waste.
Global Society and Environment	• New opportunities for trade in green technology and services.	• Less conflict over constrained resources and waste streams. • Higher value labour in energy productivity products and services	• Reduced demand on extraction of finite primary energy and physical resources. • Reduced GHG and other air and water emissions.

Figure 2 : Energy Efficiency impact and outcomes(Global Tracking Framework)

Economics of conventional energy (fossil fuels)

80% of the world's current energy comes from fossil fuels due to their low costs (Timmons et al.). The primary reason why conventional fossil fuels still hold dominion over most energy use is due to the ease of their storage, capture and transmission, especially with contrast to the extremely costly containment and transportation methods of many renewable resources. Furthermore, the current abundance has allowed the energy supply to keep up with the demand, thus allowing energy producers to constantly put off a hard shift to sustainable resources. Economic policies can play a large role in this, as they can make fossil fuels more expensive to produce and allow economies to adapt new, energy efficient technologies due to equal cost. The downside would be the significantly increased price of producing and using energy particularly for developing countries (Economics of Fossil Fuels).

Economics of current sustainable energy sources

The most commonly used sustainable energy sources are biomass, hydropower, wind power, solar energy, and geothermal energy in no particular order. The levelized cost of energy (LCOE) is used to calculate the cost comparison between different energy sources. In the figure below, the cost of renewable energy is compared with fossil fuel energy costs. In order for renewable energy to be considered cost competitive, the costs need to fall in the wholesale power price.

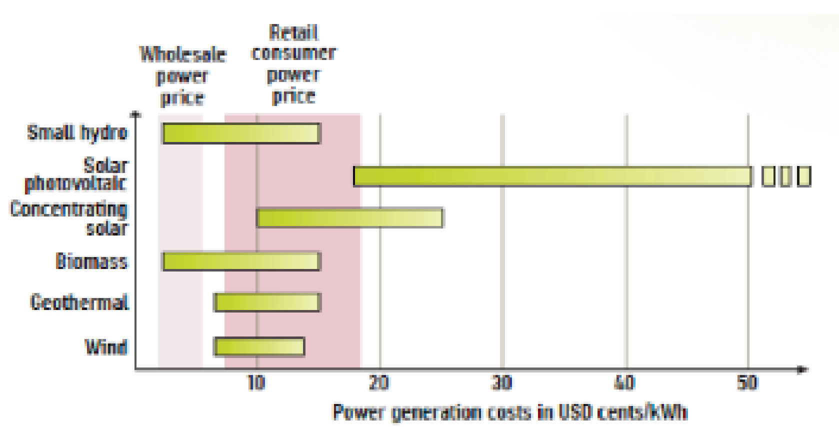


Figure 3: LCOE diagram of key sustainable energy sources (Timmons et al.)

While some energy sources, such as hydroelectricity and biomass, are cost competitive, the other sustainable energy sources are simply cost inefficient compared to fossil fuels. This leads nations to continue to prolong the inevitable shift in resources they must undergo, something that would command significant infrastructure changes and commitments. A key factor in the lower LCOE for many sustainable energy sources is the efficiency in production and utilization; for example, with solar energy, over 50% of solar energy is lost as it passes through the atmosphere. These type of inefficiencies, coupled with human waste, are why energy efficiency, especially in its capture, storage, and transmission, is critical. The diagram below displays a basic overview of how the energy system is connected. Inefficiency in any stages of this energy chain results in wasted energy, while efficiencies reduce costs for consumers and maximizes energy (Müller et al.).

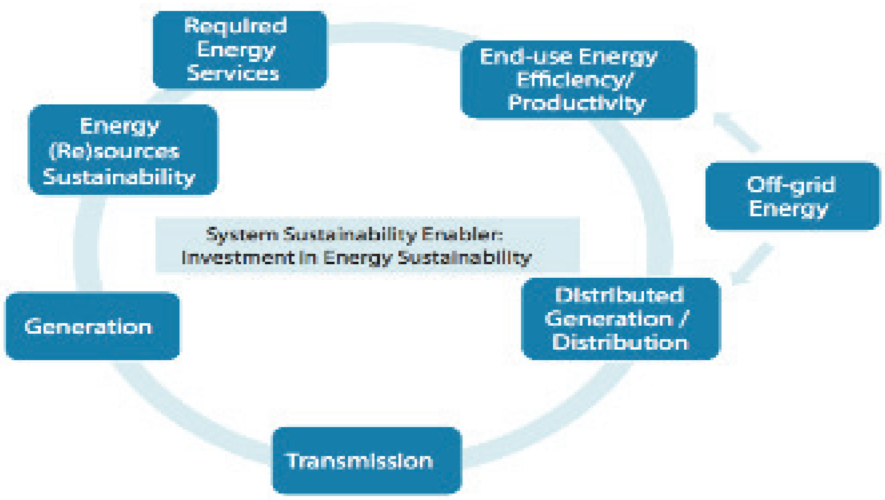


Figure 4: Energy transfer cycle(Müller et al.)

PAST UN ACTIONS/INTERGOVERNMENTAL ORGANIZATION RESPONSE

Key resolutions

In 2011, the United Nations released a document called Promotion of New and Renewable Resources of Energy, which outlined a large part of future energy. In this report, there were 4 critical UN mandates and resolutions (Global Tracking Framework).

1. Resolution 62/197: The General Assembly reaffirmed the need for putting into action the full Plan of Implementation of the World Summit on Sustainable Development, as an inter-governmental framework for energy and sustainable development.
2. Resolution 60/1: The General Assembly welcomed initiatives aimed at improving access to reliable, affordable, economical, socially acceptable, and environmentally sound energy services for sustainable development.
3. Resolution 64/206: The General Assembly requested the Secretary-General to submit a report on the promotion of new and renewable sources of energy.
4. Resolution 65/15: The General Assembly declared 2012 the "International Year of Sustainable Energy for All." Initiatives by member states and international organizations are promoting access to energy and energy services that leverage new and renewable energy technologies (Global Tracking Framework)

Further, in 2015, the United Nations adopted a set of goals as a part of the new sustainable development agenda. While all of these are vital in their own regard, Sustainable Development Goal 7 (SDG) is the most applicable for the purpose of energy development, as it encompasses affordable and clean energy. SDG 7 fundamentally has five targets:

1. Ensure universal access to energy services by 2030.
2. Increase the share of renewable energy in global energy market by 2030.
3. Double the rate of energy efficiency by 2030.
4. Enhance international cooperation to facilitate research on renewable energy, energy efficiency, and cleaner fossil fuel technology by 2030.
5. Upgrade technology for supplying modern and sustainable energy in developing countries by 2030.

The 3rd and 4th goal are especially prevalent to this committee and important to keep in mind.(SDG)

Smart Grid Systems

The Smart Grid is an electrical grid which includes a variety of operational and energy measures. "The grid" refers to "the electric grid, a network of predominantly transmission that deliver electricity from the power plant to your home or business" ("What is the Smart Grid"). A grid is made "smart" by allowing for a two-way system of communication between the utility and its customers. Smart Grid technology is an opportunity to push the electricity energy industry into a new era of reliability, availability, and efficiency that will increase both our economic and environmental health.

Since the Smart Grid involves multiple parts, it will take some time until it can be fully implemented. Some elements, like smart meters, are moving fast into final implementation. Smart meters are "digital meters that replace the old analog meters used in homes to record electrical usage" (Smart Meters). They transmit energy consumption information in a much more frequent manner than analog meters, which makes this a very important implementation. Yet other components, such as grid-level energy storage, take longer to advance. Numerous challenges exist for future Smart Grid implementation, primarily smart consumers, cybersecurity, interoperability, and smart transmission.

The implications of the Smart Grid system could be massive. Electricity feeds economic growth. The future of the Smart Grid could also lead to massive gains in clean energy, as it would allow for the broader use of alternative energy. Hydroelectric, wind and solar power offer tremendous potential, but unlike coal-fired plants, these energy sources are often located far from areas of bulk power demand(Smart Grid Implementation). The Smart Grid has potential to connect the use of clean energy to the areas that need it most and increase the potential and production of clean energy overall.

However, many issues must be overcome before the Smart Grid reaches its full potential. Creating and implementing such technology requires heavy costs and lengthy planning. The projected costs of deploying digital controls and applications on the grid average $17 billion to $24 billion a year (Smart Grid Cost). Despite this, the long-term benefits of such a system will be larger than the initial costs, and this seems to be the theme for a majority of clean-energy related projects. The widespread use of Smart Grid systems is the goal of such a venture -- to upgrade energy communications and transmission. However, the nature of this widespread project creates its own challenges as well, such as cohesion, efficiency, reliability, and prohibitive initial costs, specifically for developing countries. But the Smart Grid would bring in a new era of clean energy connection and production, and this is something we must keep in mind when weighing the costs and difficulties of such a system.

Tidal Energy/Nuclear Energy

Tidal energy is generated from the gravitational and centrifugal forces among the Earth, Moon, and Sun. The ocean is affected by the gravity of the Sun and the Moon on the Earth; it rises and falls as a result of this force, creating tides (Segura et al.). Tides are highly predictable due to the known positions of celestial objects and landmasses. This coupled with tidal powers higher energy production compared to traditional hydropower, makes tidal energy a clear cut choice for the future of hydropower. Although it is currently classified as a theoretical resource due to steep costs, insufficient technological development, and low funding, tidal energy is poised to become a large part of the world’s energy makeup in coming years.

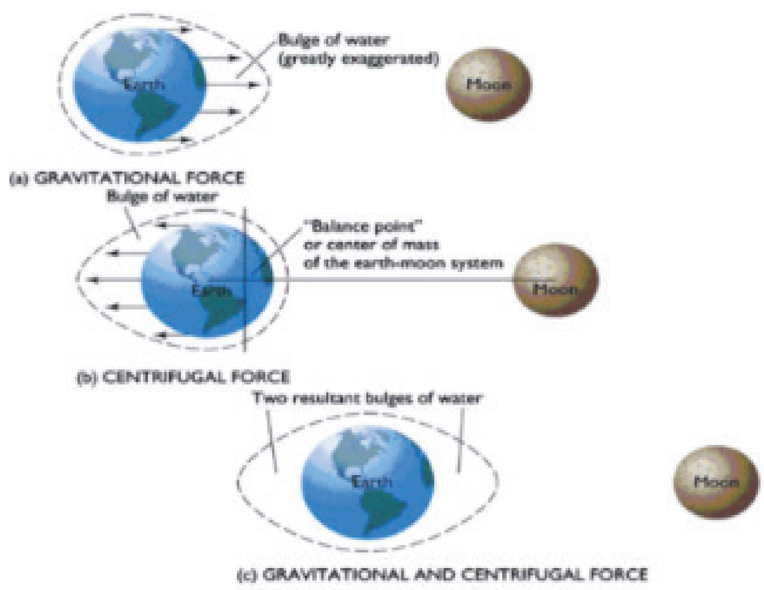


Fig. 1. The effect of the moon on the tidal range [27].

Figure 5: Planetary effects on Tidal Waves(Segura et al.)

While the majority of new technologies and energy sources were developed slowly and adopted even slower, nuclear power was utilized almost instantly. Nuclear power presented a vast energy source for electricity generation, which resulted in countries such as France, United States, and the Soviet Union rapidly developing nuclear power plants. In 1954, the US Atomic Energy Commision declared that nuclear power would provide electrical energy too cheap to measure (Yergin et al.). This declaration further sparked nuclear development, resulting in nuclear power comprising close to 20% of US electricity. However, concerns quickly arose about the dangers in storage, recycling and disposal of the spent fuel. These concerns, coupled with the disasters of Three Mile Island and Chernobyl, greatly hurt the meteoric rise of nuclear energy. Only a few countries, such as France and Japan, continued to develop nuclear energy, with nuclear energy eventually comprising 78% of France's energy electricity makeup (Yergin et al.).

Carbon Capture and Storage(CCS)

Carbon capture and storage (CCS) has been highlighted as a key technology for mitigating carbon emissions. It is a system that captures carbon dioxide emissions produced by the use of fossil fuels. Furthermore, "the use of CCS with renewable biomass is one of the few carbon abatement technologies that can be used in a 'carbon-negative' mode – actually taking carbon dioxide out of the atmosphere" (What is CCS). Carbon capture and storage is a very important technology for sustainable energy development.

The basics of the technology involve three different steps: capturing carbon dioxide, transporting carbon dioxide, and securely storing carbon dioxide emissions underground. Capture technologies separate carbon dioxide from other gases produced in industrial processes. The carbon dioxide is then transported by pipeline or ship and stored in certain geological rock formations located underground.

Although carbon capture and storage has great potential, it is still at a developmental stage. According to the International Journal of Greenhouse Gas Control, "the full-scale projects required to test the technology have proven difficult to implement, with lack of societal acceptance considered a key contributing factor to this delay"(Lessons from CCS). Yet, there are still a select number of successful implementations. One example is in the Netherlands, where the Dutch CATO CSS research community has established an implementation plan that serves as a helpful roadmap for other industries wishing to do the same. Canada has also recently created the world's first commercial-scale CCS plant, showing the world that burning coal does not have to coincide with unsustainable emissions.

The implications for carbon capture and storage are enormous. If this technology is used on a wide scale across the globe, industries could cut their carbon emissions by massive rates, reducing overall air pollution. Carbon capture and storage contributes greatly to a future of clean and sustainable energy. It helps bridge the gap and offers industries an alternative form of sustainable energy until our global community can completely shift to a low carbon economy.

Costs are still relatively high for CCS. Capture accounts for a ¾ o the total CCS costs (Costs and Challenges). CCS also raises the cost of electricity. Challenges for implementation and effective widespread use of CCS also include regulation, public acceptance, and financing. Many CCS projects have been cancelled or delayed for these reasons. However, once the technology is accepted, it could contribute greatly to the goal of sustainable energy.

Advanced batteries and fuel cells

In recent years, there has been an increasing amount of research and development done on clean energy sources, especially on the use of advanced batteries and fuel cells. There are many types of batteries that are available for commercial and personal use, including solid state, aluminum-iron, lithium-sulfur, and metal-air batteries (Emerging Battery Technology). However, the most popular type of battery is the lithium-ion battery, which is used in a wide variety of products, ranging from cell phones to large electric vehicles (Emerging Battery Technology). With new production technologies, the cost of lithium-ion batteries has significantly decreased in the past decade and has led to their widespread use in everyday products (Electric Vehicle Battery). In addition to this, automobile companies are trying to develop more advanced lithium-ion batteries to use for electric vehicles; some companies, like Nissan and Tesla, have successfully harnessed this technology and are developing a new industry for clean-energy cars (Electric Vehicle Battery). While there are a lot of benefits to battery-powered technology, there are still major drawbacks, including limited battery life, unethical sourcing of battery materials and electricity, and safety hazards with regards to thermal stability (Electric Vehicle Battery). Many researchers are working on ways to solve these issues, but others are turning towards other possible clean-energy sources, one of them being fuel cells. These devices require hydrogen and oxygen in order to create electricity and water as a byproduct. Unlike batteries, fuel cells can continually produce electricity, as long as hydrogen and oxygen are available (Fuel Cell Technology). In addition to this, they produce almost zero carbon emissions, which makes them a promising technology for automobiles and urban infrastructure (Better energy source). As of right now, fuel cells can be used to power medical devices, cell phones, laptops, NASA rockets, and cities (Fuel Cells and clean energy, Better energy source). That being said, fuel cells are still not as common or as accessible as batteries, because they are much more expensive and require hydrogen, which is difficult to capture and store (Fuel Cells, Fuel cells and clean energy). While both of these technologies have the potential to be implemented throughout the world, it is still important to think about the financial burdens and infrastructural issues that humans will face along the way.

Wireless energy transfer

Seeking more convenient and accessible ways to recharge batteries, researchers have been working on advancing wireless energy transfers. In these systems, there is a transmitter device that transfers energy to a receiver device without the use of cords or outlets (Wireless Energy Transfer). There are two main types of wireless energy transfers--near-field and far-field. In near-field transfers, the transmitter and receiver devices must be located close together in order for the energy to pass through (Wireless Energy Transfer). This type of energy transfer has already been put into commercial use; some examples are electric toothbrush charging stations and wireless phone and laptop chargers (Wireless Energy Transfer). In contrast, far-field transfers can be used for longer distances and larger-scale concepts; examples include cell phones, radio, television, and WiFi (Wireless Energy Transfer). While wireless energy transfer is quite common already, researchers are trying to advance this technology even more in order to develop cleaner cities and more efficient urban infrastructure. A group of scientists from the Japan Aerospace Exploration Agency

(JAXA) has managed to use microwaves to deliver 1.8 kilowatts of energy to a receiver that was located 55 meters away (Japan Wireless Energy breakthrough). These researchers hope to eventually set up a space solar power system, where they can capture solar energy from satellites and then transfer it back down to Earth using microwaves (Japan Wireless Energy breakthrough). In addition to this, some researchers are trying to implement wireless energy transfer into streets and highways so that electric vehicles can be easily recharged on the go (New approach). This technology can also be used for health and safety reasons, such as powering implanted medical devices or providing energy to areas where it might be dangerous or costly to use conventional wires (Wireless Power). Although there are several benefits to using wireless energy transfer, researchers are still uncertain about the potential health risks caused by high amounts of electromagnetic radiation (Wireless Electricity on humans). In addition to this, implementing this technology into cities can be extremely costly with regards to construction and maintenance (Infrastructure Costs).

INTERNATIONAL ACTIONS AND RESPONSE

Main regions and governments

Almost all countries have agreed to the previously mentioned resolutions and have expressed the need to focus on energy development and the efficiency of energy. While many countries take a more citizen based approach, such as raising awareness for wasted energy, there are many European countries that have pushed technological development to become more effective. For example, Sweden implemented a system where each of its 290 municipalities has an energy advisor to whom citizens can turn for guidance on maximizing energy efficiency in their own household. In countries like Austria, the government has set energy efficiency measures for companies selling above 25 GWh (Energy Efficiency). These two countries highlight different ways of approaching the same problem while continuing research and implementation of more energy efficient technologies. Sweden, in particular, has been extremely active through implementations of large scale projects such as the Stockholm Royal Seaport urban smart grid, where a smart grid in the seaport is used to integrate the entire electricity supply system, effectively maximizing energy usage and serving as a pilot project for smart grids in an urban environment. In Africa, Kenya and Uganda, in particular, have worked to create energy efficient facilities. For example in Uganda, projects have been undertaken to build power factor correction facilities, construct solar water heaters, and conduct energy management training. A large problem in the process of moving toward more energy efficient sources is funding, as many projects are often less than 50% funded.

In India and other population dense countries energy efficiency is critical, as the value of saving just 15-30% across all sectors can result in $11 billion (World Bank Energy Efficiency). The World Bank has been of great use in the specific case of India by developing a partnership with Energy Efficiency Services Limited (EESL), which provides resources for public sector energy efficiency in India. With an added $300 million in funding as of May 2018, India has the opportunity to implement numerous energy effective technologies.

Intergovernmental Organizations Integral in the Response:

The International Energy Agency (IEA) is comprised of 30 member countries and is focused on 4 areas: energy security, economic development, environmental awareness, and engagement worldwide. The IEA was originally created to meet industrial countries' energy organization needs in the aftermath of the 1973-1974 oil crisis. Furthermore the IEA manages energy supply and serves as the most influential think tank utilized as a source for policy makers. The organization has been criticized for placing more emphasis on fossil fuels and nuclear energy than more energy efficient technologies for sustainable energy sources. Ultimately, the organization does little to work towards maximizing energy sources and improving energy development.

CASE STUDY: STOCKHOLM ROYAL SEAPORT URBAN SMART GRID

The Stockholm Royal Seaport Urban Smart Grid is a perfect example of how smart grids have the potential to lead to smart cities which in turn use sustainable energy in order to increase efficiency and move towards a greener future. The Royal Seaport is the largest urban development area in Sweden. Its objective is to, "further address high energy efficiency by increased consumer awareness and technical support for an energy efficient lifestyle"(Royal Seaport). Planning work started in the early 2000s and the new city district is estimated to be completed around 2030. The Royal Seaport Urban Smart Grid exemplifies how a smart grid can be utilized in an urban environment. If this project is successful, it will be a crucial blueprint for other cities alike to integrate Smart Grids into their own plans for future energy consumption.

Stockholm's rapid expansion creates a demand for sustainable development; the Royal Seaport Urban Smart Grid is a foundation for this development, particularly in an urban setting. It is one of Europe's largest urban development projects and an international model for sustainable urban planning. In total, about 12,000 new apartments and 35,000 workplaces will be built (Stockholm). The smart grid has three phases of development: a pre-study which was conducted in 2011, an active pilot apartment called the "active house" that was monitored and evaluated to further assess and develop the project, and now, future plans for 170 more "active" apartments, a smart grid lab, and a data repository system. In order to meet Stockholm's growing need for housing, the project involves transforming former industrial land into an attractive and sustainable urban housing district. Aside from the new building developments, jobs will be created as well, where innovative environmental technologies are promoted.

A main goal of any Smart Grid is to enable consumers to play a more active role in the energy market. One way to do this is through the "load-shifting" that is incorporated into the Royal Seaport project. This is where consumption is moved from periods of high-demand (high-peak hours) to those of low-demand (low-peak hours) (National Impact). Load-shifting is a component of intentional consumption called "demand-response" and it is one of the most important tools of a Smart Grid. These technical ideas are crucial to how Smart Grids can change national and international energy consumption.

Sweden currently has a very competitive power industry, which is why Stockholm is able to finance the massive project with funds coming from the Swedish Energy Agency, Vinnova, and participating companies/organizations. Although funding does not seem to be too big of an issue, there are other risks at play. The two main concerns with a Smart Grid are active consumer participation and privacy and security concerns.

In order for consumers to reap the benefits of a smart grid, they must be active participants in the system. This includes reacting to information they receive, being environmentally aware of where they are living, and fully utilizing the devices at their disposal. Consumers are a part of the system, so their participation is crucial for the benefits of the grid to outweigh the costs. One way to ensure consumers are active is to create trainings for citizens and have Swedish institutions continuously collaborate with each other to share knowledge and information. There also exist certain legal hurdles in promoting the Smart Grid, but a council of Stockholm has proposed certain necessary changes. It should be the role of any government attempting to implement a smart grid to create a supportive environment for such a system to work. This includes legal background, tariff structure, support of pilot projects, trainings, and overall public awareness.

Privacy and security of data are other main concerns when creating a smart grid system, mainly because of how highly interconnected the system is and how vulnerable it could be to cyber attacks. However, those in Stockholm have not been as proactive in solving this issue. Yet, the benefits of the Royal Seaport Urban Smart Grid will still eventually outweigh the costs, if the system is working effectively.

Overall, the main impact of the Royal Seaport Urban Smart Grid will be the role it plays as a blueprint for all other cities around the world wishing to implement the same system and move towards a more sustainable future. The Smart Grid project hopes to produce massive impacts on renewable energy usage, demand response, load shift, two-way communication between producers and consumers of electricity, and even joining those two components together by having consumers produce their own renewable energy, which is the main idea of the "active house". There are many aspects to the Royal Seaport Urban Smart Grid system that make it an extremely important project in terms of future sustainability. If the project is a success, we could see a massive shift in urban development and energy consumption around the world.

QUESTIONS TO CONSIDER

Question 1: How will any plan made address variable conditions in the future. Will current energy efficiency technologies be effective enough at the end of 10 years?

Question 2: How does each countries economic policy affect their energy development goal? How does the tradeoff between the two affect each countries goals in energy development?

Question 3: How does creating a framework for the next 10 years impact energy policies? What would short term energy goals look like compared to long term energy goals?

Question 4: Is energy storage, essentially battery technology, holding back energy efficiency? If so will every country be willing to invest in the technology for initially small returns?

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TOPIC B: FEASIBILITY AND DEVELOPMENT OF SMART CITIES

TOPIC BACKGROUND

Historical Background

Urban growth increases every year, and according to UN data, the percentage of people living in urban environments crossed 50% in 2007 (Anthopoulos et al.). The current urban landscape faces many challenges, such as gridlocks, inconsistent power supply, etc., that can be solved with a more efficient city. These urban issues gave rise to the concept of a smart city, which is frequently mentioned without a clear concise definition. A smart city can be defined as a city that utilizes data and technology to increase efficiency, improve sustainability, create economic development, and enhance quality of life factors for people living and working in the city with a smarter energy infrastructure.

The smart city concept first appeared in literature in 1997 which introduced the web or virtual city in an effort to describe information and communication technology (ICT) based cities. Virtual cities were an attempt to utilize the potential of the internet for typical urban tasks, such as supporting the local democracy, marketing, and service delivery. While ICT was the basis of the first virtual city, it quickly evolved into the information city, which was a metropolitan area where the ICT was the driver of online services. The digital city finally became the ubiquitous city, where data was available everywhere through embedded urban infrastructure (Anthopoulos et al.). The image below is a timeline of the key events in the history of smart city development. These moments mark advancements of smart city development but don’t fully show turning point moments in the development of advanced urban environments.

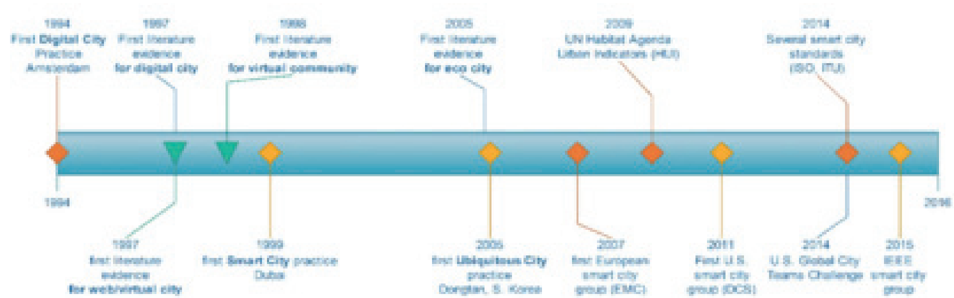

Figure 1 : Timeline of Smart city development(Rise of the smart city)

In 2011, there was strong funding for numerous smart city projects, the most ambitious of which was the Songdo International Business District, a brand new city build from the ground up with cutting edge technology. In many of the projects, such as Austin, and Barcelona, enterprises provided the technology and had to cooperate with local governments. However, when local governments buy technology, they rarely optimize the performance in the same way companies can, as companies are focused on the bottom line. Due to poor implementations, funding dried up before any truly successful projects were implemented. In the case of the Songdo International Business District, the city itself was the pinnacle of modern technology, with all waste being sucked out of houses and recycled to generate electricity, computers built into streets to control traffic, remote operation and advanced apartments (South Korea's Smartest City). However, once it was completed it had only 70,000 residents, less than a quarter of what was expected due to its extremely high cost of living and the lack of cars. In the effort to remove the problems faced by modern cities, the designers behind Songdo fundamentally miscalculated the wants of citizens and focused on building the perfect city.

Data driven age and rebirth of smart cities

A large part of smart city development is dependent on user driven data, which allows urban planners to build a city that is suited for its target population, its citizens. Many previous smart city projects failed to consider the importance of this, but with the rise of big data--analyzing large data sets to reveal patterns, trends, and associations regarding human behavior and interactions--urban planners are able to more clearly pinpoint human needs and build supporting infrastructure. Data capturing technologies such as urban sensing utilized in Singapore, London and San Francisco, help provide analytics capturing how people interact with each other and their surroundings. This data is then utilized to more effectively manage traffic, garbage disposal, and utilize energy. The Chicago Array of Things project is a strong example where sensors are placed all over urban Chicago, gathering data on simple things such as air quality, road quality, and urban congestion, effectively allowing policymakers and urban developers alike to help improve their city (Array of Things). To address the concerns of residents over data security, all the data is accessible by citizens through an online portal.

A large and important concern of many residents in advanced urban settings is data privacy. This has become increasingly important, especially to policymakers, through recent data breaches such as the Cambridge Analytica scandal, where Cambridge Analytica, a political consulting firm, collected data on over 87 million Facebook users and attempted to influence voter opinions. As a result of this massive breach in personal information, numerous companies began to make personal data completely accessible to the user as well as implementing stronger data control policies. In a smart city, where the infrastructure itself is based upon user driven data, it is imperative to maintain the privacy of users data while utilizing it to create a more efficient city.

KEY FACTORS FOR SUSTAINABLE SMART CITY DEVELOPMENT

There are four main categories or "box" types of smart cities (Rise of the Smart City)

1. Information Technology (IT) box: a private company initiates the smart city and private funding business model.
2. Dreambox: public-private partnership (PPP) for project definition and respective business model.
3. Fragmented box: many projects initiated by various stakeholders with little or no integration.
4. Black box: initiated and managed by (local, state or national) Governments or public agencies, with "invited" companies to enter this ecosystem.(rise of smart city).

Not all smart city approaches are suitable for every urban area, but various parameters can determine which direction a smart city should evolve. Figuring out which box is best for each urban area is critical to effective growth and something that needs to be defined. Regardless of which box works for certain urban environments, there are six fundamental indicators of smart cities that are widely accepted: Smart Economy, Smart People, Smart Governance, Smart Mobility, Smart Environment, Smart Living (Rise of the Smart City).

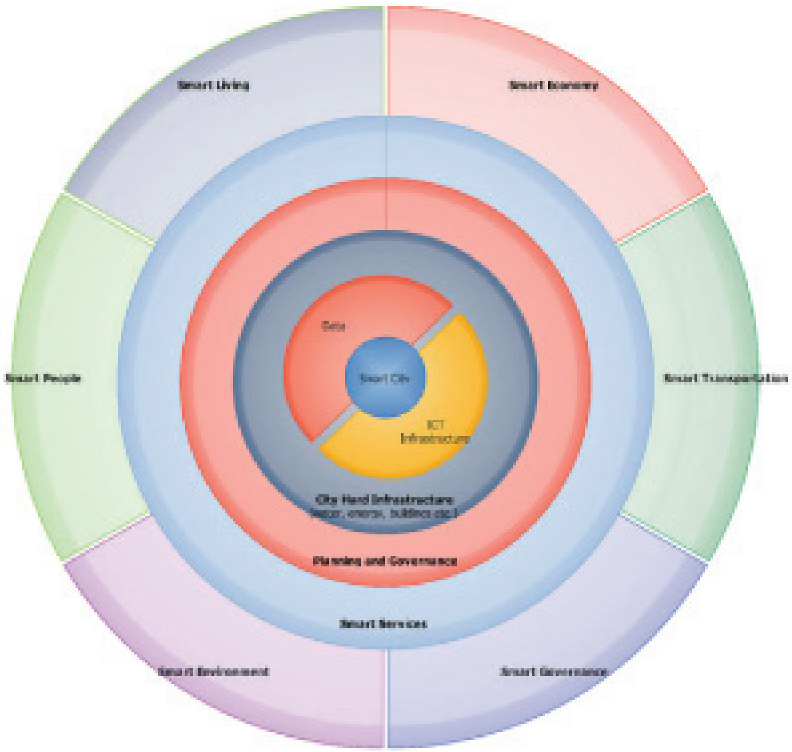

Figure 2 : Smart City Framework 1(Rise of the Smart City)

Smart Economy is the technology and innovation required to strengthen business development, employment and urban growth. A Smart Economy lacks a proper definition, and is loosely defined by scholars. However, the fundamental goals of a smart economy are similar to that of an efficient economy, with focuses on aspects such as a knowledge-based economy, entrepreneurship generated out of individual effort, high productivity, flexibility of labor market, high quality of life, and other high performing economic standards (Facilitating smart Cities).

Smart People are the result of ethnic and social diversity coupled with creativity and tolerance. The core of the concept of Smart People is strong education, an inclusive society, and creativity used in solving problems faced by the community (Facilitating Smart Cities). The concept of Smart People has been something that numerous cities and governments alike have worked towards, and it is something that universities and schools have had a strong impact on.

Smart Government focuses on e-services such as e-government, crowdsourcing, and a transparent decision making process. In the data driven rebirth of smart cities Smart governance hinges on transparency of data and inform decision making (Rise of the Smart

City). A prime example of a smart government is e-Estonia, widely regarded as the most advanced digital society. Estonia implemented a government cloud solution that provides a foundation for public e-services and solutions, electronic voting through its highly secure i-Voting system, and state e-Services available to all citizens via a portal.

Smart Mobility has been a goal of many cities for numerous years, and is often the first step in smart city development. Smart Mobility is achieved through intelligent transport systems and efficiency. While many cities have been able to establish effective public transportation, such as the The Singapore Mass Rapid Transit(MRT), transportation is one part of Smart Mobility. Intelligent traffic planning, which focuses on the interconnectedness of road users, is of growing importance as bigger cities are faced with more traffic jams. Cities without effective public transportation are unable to become efficient systems, as transportation systems are the hearts of smart cities.

Smart Environment is the use of advanced technology in natural resource protection and management, as well as efficient energy use. The smart grid is especially critical to this part of smart cities as it efficiently manages all the cities energy. A smart environment is a combination of sustainable resource use/development and energy efficiency through optimal water and energy use (Facilitating Smart Cities).

Smart Living is the most noticeable aspect of smart cities and arguably the most important. Smart Living compromises of effective access to city facilities such as housing and utilities, safety, and social services. Smart living reflects the citizens' vision for their quality of life, which includes e-health systems and improved public safety. Looking at e-Estonia, their smart public safety system has reduced risk and death rates by making simple changes, such as cars not being stopped for technical checks as the information is available online. Concepts and technologies that enhance the smart people that live in these cities is a large part of what makes an urban area "smart" (Facilitating Smart Cities).

In the breadth of smart services there are 9 common service groups (SG) that appear in traditional smart cities: e-Government services, e-Democracy services, smart business services, smart health and tel-care services, smart security services, smart environmental services, intelligent transportation, typical telecommunication services, smart education services (Rise of the Smart City). These services, combined with the six indicators of smart cities and box types, comprise the core framework of what a smart city should resemble, but it is up to each city to determine which framework is most suitable for their city. Cases such as e-Estonia and Sidewalk Toronto seem to be the leaders in effective smart city frameworks, and the concepts are applicable to wide range of cities. While environmental factors often dictate what type of technology can be built and how resources can be allocated their a general pattern and framework that remains the same for all smart cities.

Figure 3 : Smart City module framework(Rise of the Smart City)

These figures highlight two approaches to a smart city framework that are implemented in almost all advanced urban settings. Figure 3 displays how the digital sector of a smart city would function, highlighting five main sections in Applications, Management, Services, Data, and Business. Figure 4 shows how the layers of a smart city would interact with each other along with what each layer would be comprised of (Rise of smart city). These two approaches work together and have been implemented in smart cities such as Estonia and Stockholm. However, it is still important to keep in mind the importance of user focused technology rather than simply building the most advanced version of each sector and layer.

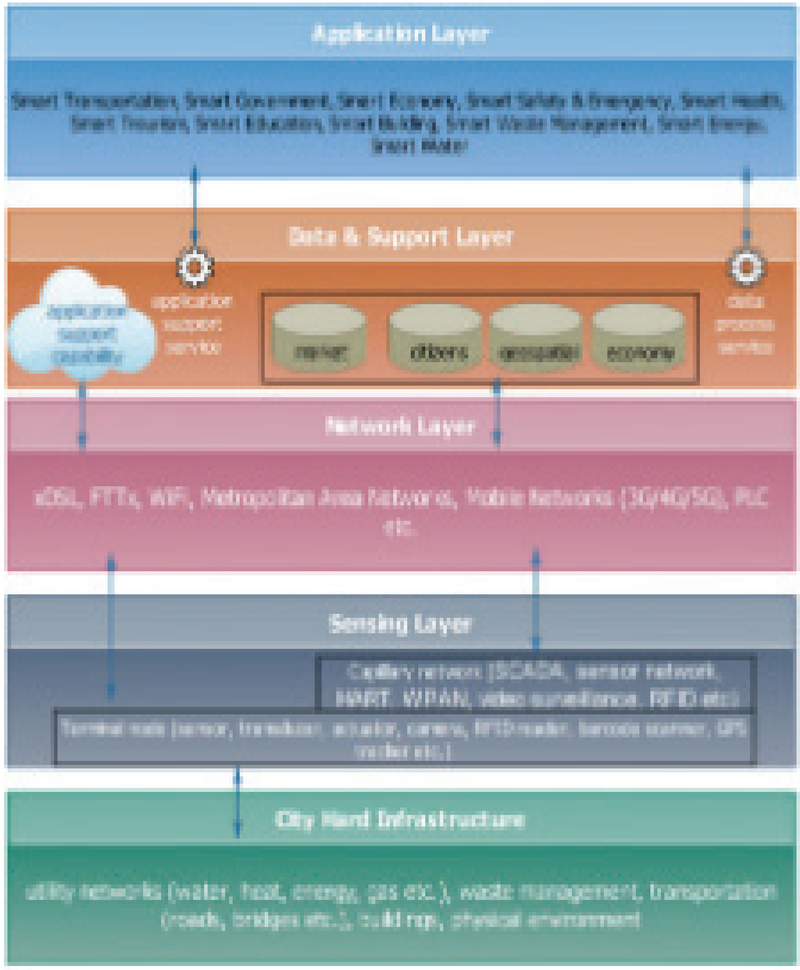

Figure 4: Smart city layer framework(Rise of the Smart City)

Sustainable cities vs smart cities

As urban development becomes increasingly important, two main types of advanced urban cities have surfaced as models for future development: sustainable cities and smart cities. A city is defined as sustainable "if its conditions of production do not destroy over time the conditions of its production" (Ahvenniemi). In contrast, a smart city is more focused on building a city where human capital and technology work to fuel sustainable economic growth and high quality of life. There are three main indicators of sustainability: Economic, Environmental, and Social Sustainability (Ahvenniemi). While both sustainable city frameworks and smart city frameworks work toward these three targets, the emphasis they place on each criterion differs significantly. Figure 5 below shows the distribution of focus on each of the key sustainability indicators.

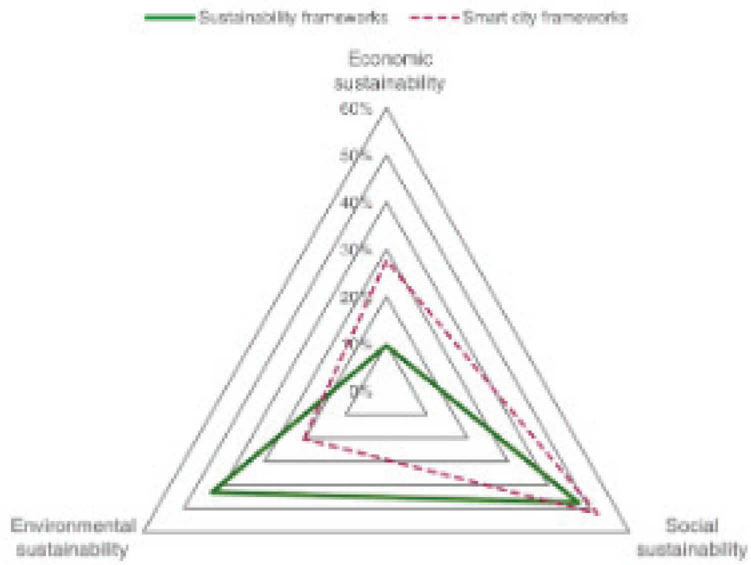

Figure 5 - Charting 3 key indicators(Ahvenniemi)

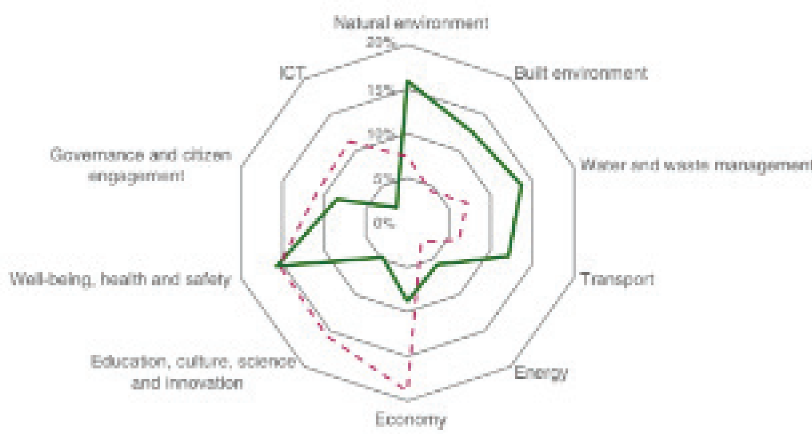

Figure 6: Charting ten sectors(Ahvenniemi)

While both frameworks are heavily focused on social sustainability, which is the most user-centric of the indicators, they are almost opposite when comparing the focus between economic and environmental sustainability. When looking deeper into the indicators of social sustainability, smart cities focus much more on education, culture, science and innovation while the sustainability frameworks focus on more environment related sectors, such as the natural and built environment, water and waste management and transport (Ahvenniemi). However, well-being, health and safety is the sector under which about one third of the indicators fall in both types of assessment systems, which highlights a similarity between the two city frameworks in social sustainability.

The figures above were calculated based on data focused on ten sectors that are essential to all cities. Figure 6 shows the sector as well as which sectors each city framework allocates the most resources for. While both frameworks prioritize well being, health, and safety, they are different in every other category. Analyzing these results make it clear as to why smart cities are more sought after and constructed in comparison to sustainable cities. Sustainable cities are more focused on the environment than on the citizens in the cities itself, and due to cost and resource issues, it is difficult for a either city to allocate funds and technology equally among all sectors. Thus, the smart city, which focuses more on the economy, education, governance, and well being, is more important in today's society. One important thing to note, however, is the lack of resources allocated to energy in smart city frameworks, which is something that is truly important in the new age of smart cities, as shown by projects such as Sidewalk Labs' use of the thermal grid in their project.

Smart Grid

The smart city itself is all is based on the idea of the city communicating with itself in order to make it as efficient as possible. In recent years significant research has been dedicated to creating an integrated infrastructure system and the first step on that path is the smart grid, an network that communicates within itself to manage energy efficiently. As noted by the IEEE "the energy infrastructure is arguable the most important feature in any city," further emphasizing the importance of an integrated electrical system (Facilitating Smart Cities). The power grid network is the backbone of any city, and privies the energy required for everyday operations. The current power grids in cities increase losses through mass inefficiency. On average, 62% of energy is wasted in the conversion process from natural sources to electricity. Due to the centralized nature of the common power grid, is it significantly more vulnerable to natural disasters and cyber attacks. These are a few of the factors that have led to the importance of smart grids, especially as the backbone of the new smart city. Along the same line is the concept of the thermal grid, which, albeit newer, has the potential to maximize energy and heat use when coupled with the smart grid, thus improving the lives of citizens and helping the city alike.

Digital divide

Human interaction with technology has risen at an exponential rate over the course of the past century. The ability to access the internet and technology has become a daily part of life, so constant that projects like LinkNYC are crucial for future smart city development. Unfortunately, everyone is not able to utilize this technology. The “digital divide” is the social and economic inequalities which come about as a result of who has access to communication technology and how they use it. As the number of people who have access to internet and computers rises, so does the digital divide, growing so large that it has been called the “digital chasm.” Three key factors are responsible for the digital divide: widening levels of education, income, and race (The Digital Divide). The problem itself is best addressed through the root of the problem itself, which is education and cost of technology. The digital divide is an issue that threatens to grow exponentially larger unless it is addressed, and it is especially important for smart cities to address this issue in order to allow each citizen to maximize their life quality in the city.

SHORTCOMINGS OF SMART CITIES

The large issue with smart city development is the lack of non-ideological visions of smart cities (Addressing Shortcomings). Smart city development halted in large part due to an idealistic approach and literature backing this approach. A rise in data utility, technology, and private sector companies entering the urban development market has given smart cities a second chance. There is a lack of in depth-empirical case studies of specific smart city initiatives and comparative research that compares smart city technology (Addressing Shortcomings). Instead, there are numerous publications on how a smart city should be built and abstract concepts. Currently, numerous smart cities don’t embody all the traits of a smart city but rather implement technologies that get the city closer to peak urbanization, such as LinkNYC and the Stockholm smart grid. Cities such as Songdo, which were expected to be a complete city fundamentally failed at focusing on the user of the smart city and became ghost towns. Building frameworks has become more dependent on examining successful examples and specific initiatives that can be implemented in the city of discussion (B6). Building a true smart city will have to be more focused on empirical projects and initiatives rather than the broad concepts of the first wave of smart cities that led to its fall.

KEY ACTORS

Many countries have built a few smart cities within their countries and are invested in the development of urban technology. However there are a few countries that are leading the way in development. The United States has been a consistent presence in smart city development, whether through government funded projects or private sector companies. Prominent smart cities in the United States include Chicago, Boston, and Columbus, which won the US department challenge and received 40 million dollars to develop smart technology. Nordic countries such as Sweden, Denmark, and Norway have led the world in smart city innovation with countries such as Stockholm and Copenhagen leading the way in eco-city development as well as efficient energy development. Less effectively urbanized countries, such as India, have strived to adapt mass urbanisation by fully committing to smart city development. In India's case, they have started projects to develop 90 new urban centers utilizing smart city technology in the majority of these cities.

United Nations Action

In the 2015 United Nations sustainable development agenda one of the key goals was SDG11, making cities and human settlements inclusive, safe, and resilient. This developmental goal has led to increased smart city development as well as the the creation of the United Smart Cities Program (USC) by the UN Economic Commission for Europe (UNECE) (United Nations Partnerships). The USC aims to examine smart cities in a geographical context as well as establishing clear indicators. The program is meant to address barriers to bringing key urban solutions to areas in need. While it does serve as a good thinktank and facilitates information it does little quantifiable work in developing smart cities and thus falls short of the ultimate goal of furthering urban development

The United 4 Smart Sustainable Cities (U4SSC) is an initiative coordinated by the UNECE. U4SSC is a global platform for smart city stakeholders that advocates for policies to encourage the use of Internet and communications technology (ICT) to facilitate the transition to smart sustainable cities (U4SSC initiative). The goals of this initiative are to generate guidelines for the integration of ICT into urban operations based upon predetermined key performance indicators (KPIs), and to help streamline smart sustainable cities action plans. Unfortunately, this program is quite similar the USC in the sense that it serves as a think tank that determines solid guidelines, but doesn't dictate anything regarding funding or necessary policy accommodations regarding data use and private company involvement. While the UN has been key in determining guidelines on creating smart cities they have not tackled key issues behind further development.

Policy importance

Cities are incredibly difficult to change, with factors such as risk aversion, funding, vested interests, and other barriers preventing effective action. One of the primary factors preventing smart city technology from being effectively implemented is a disconnect between policy and technology. Many basic systems of smart cities, such as traffic/parking control, waste disposal, and data usage are either not allowed or severely hampered through policy meant to help citizens. Many seemingly insignificant urban planning laws such as building permits will have to be revised to accommodate urban development. (Political and Legal) A prime example is in San Francisco, where there are many parking apps aimed to rent out parking spots; however, this concept violates local law and was consequently banned (Public Parking). It is important to make sure that smart city technology is properly regulated by state governments while being given the freedom to operate effectively. Smart city management law has yet to be effectively implemented and is an especially interesting component left out of many United Nation smart city projects. Large scale smart city failures such as Songdo have led to a new age of projects less focused on infrastructure development and more focused on user centric development merging government cooperation and private company expertise.

PRIVATE SECTOR RESPONSE

Smart city development is especially interesting due to the lack of non-governmental organizations (NGO) involved and the large amount of private companies involved. In almost all smart city projects, private corporations have supplied the necessary technology to fuel the urban development. Unfortunately, this often leads to a clash between local governments and company leaders, as the ultimate goal tends to differ. Due to this, many smart city projects have been extremely ineffective and gave rise to private companies leading the charge themselves.

Sidewalk Labs

One of the most prominent private sector smart city projects is Sidewalk Labs, Alphabet Inc's urban innovation organization, whose goal is to improve urban infrastructure and address key urban issues such as cost of living, transportation, and energy usage. Sidewalk Labs' keystone project is Sidewalk Toronto, a joint effort by Waterfront Toronto and Sidewalk Labs to combine digital technology and the latest urban design to combat the biggest urban challenge, essentially the core principles of a smart city (Sidewalk Toronto). Sidewalk's key goal is ultimately using user centered technology to build a new urban hub utilizing new construction methods and neighborhood designs to make housing more affordable. This project is the flagship project for the new generation of smart cities, which instead of focused simply on seemingly perfect technologies, focuses on user centered design and technology. Sidewalk's main platform integrates digital and physical layers to form the baselines for urban innovation. The digital layer is composed of four essential components (Sidewalk Toronto).

1. Sense component: connects a distributed network of sensors that collect real-time data on the surrounding environment.
2. Map component: collects location based informationen the infrastructure, buildings, and resources in the public area.
3. Account component: provides a personalized portal through which residents can access public and private services.
4. Model component: simulates "what if" scenarios for city operations to plan for.

At the core of Sidewalk Toronto's energy sustainability goals is a thermal grid that taps into existing sources of energy for circulation and reuse, essentially heating and cooling buildings without fossil fuels. The technology behind it is similar to the concept of a smart grid's electricity management, but is able to have a far larger impact. Beyond simply creating a new concept through Sidewalk Toronto, Sidewalk's ultimate goal is for this project to serve as a demonstration project for cities everywhere (Sidewalk Toronto).

LinkNYC

LinkNYC is an in infrastructure project created by the City of New York and private companies that aims to create a network covering numerous cities with free WiFi services. The LinkNYC project replaced over 7500 payphones in New York with structures called "Links" which provide free public WiFi, phone calls, charging, and access to city services, maps and directions (CityBridge|LinkNYC). These links help enhance citizens' lives by solving simple but critical problems, such as being unable to contact emergency services due to loss of battery, losing track of directions, or simply needing internet services to contact an acquaintance. The LinkNYC team itself is comprised of the City of New York and CityBridge, which is an association of experts in connectivity, user experience, and technology (CityBridge|LinkNYC). The project itself is free due to funding through advertising, and through the advertising, these Links generate more than a half billion dollars in revenue for New York City, thus providing citizens with beneficial upgrades to the city and profiting the city at the same time. Each Link itself is equipped with digital screens that are used for public service announcements and advertising, thus ensuring that in the case of emergency all areas of the boroughs of New York City can be warned promptly (CityBridge|LinkNYC). The benefits of this program are immense, providing the citizens with easily accessible internet connection, public service announcements, calling services, and other useful information while creating 100-150 jobs and bringing in revenue for the city.

Amazon Go & Whole Foods

Amazon has dominated the e-commerce space for many years and has ventured into many other sectors as well. One of Amazon's exploits into different sectors is particularly important, and that is its acquirement of Whole Foods. Amazon has been trying to grab a foothold in the grocery industry; its first try was AmazonFresh, which was an e-commerce grocery concept. Unfortunately, e-commerce groceries have failed to gain traction for numerous reasons, such as people preferring to judge and pick their produce themselves. Amazon's latest push into the grocery industry is through their new concept Amazon Go, a grocery store that is partially automated, allowing customers to purchase products without a cashier, checkout centers, or paying in the store (Inside Amazon). Through computer vision, deep learning algorithms, and sensor fusion, Amazon is able to automate purchases. The concept is a revolutionary idea that is based on the mass use of smartphones and geofencing to improve the customer experience. The user scans into the store using the Amazon Go app and is able to walk out of the store with their products; they will be charged by Amazon to their account. There is currently one Amazon Go store in Seattle, but Amazon has plans to open stores in Chicago and San Francisco (Inside Amazon). Amazon's purchase of Whole Foods gives Amazon numerous locations to implement its Amazon Go concept in a grocery store that has a proven user base. Combining these two, Amazon is poised to reinvent the grocery industry entirely and transform user experience.

CASE STUDY: E-ESTONIA

In 1997, the country of Estonia established an online governance system, which allowed citizens and residents to access public services through the internet. Over the past two decades, engineers and researchers have developed e-Estonia to become more comprehensive and safe, urging other countries and organizations to follow their lead. Some of the services available through e-Estonia include a simple tax return system, mandatory digital IDs, online voting, and a transparent health program (Digital Society). These public e-services have significantly reduced government spending and have made bureaucratic systems much more streamlined and user-friendly. With the rapid development of technology, many experts suggest that it is just a matter of time until all government systems adapt to the online world.

Because e-Estonia provides readily accessible information and public services, it acts as an equalizer for people of different origins, ages, and experiences. Civil duties such as filing taxes and voting can often be difficult and complicated processes in other countries, but with this online platform, Estonian citizens all around the world are able to access their data online and complete these tasks within three to five minutes (Estonia, the Digital Republic). Estonia also established their e-Resident program, in which foreigners can apply for an Estonian digital ID and develop businesses in the European Union (Digital Society). In doing this, Estonia is hoping to attract international businesses and encourage technological innovation (Digital Society). In addition to this, Estonian citizens are required to have a digital ID card, which holds embedded files that contain their personal information; this data includes finances, education, land ownership, and also healthcare (Digital Society, Estonia, the Digital Republic). Health providers are able to access previous medical history, which makes doctor's appointments much more efficient and has also halved the number of accidental deaths in the past two decades (Digital Society). In order to secure people's personal information, e-Estonia developed a system called X-Road, which ensured that people's data were stored locally rather than on a central database (Digital Society). However, e-Estonia is still dealing with cybersecurity issues, and it is important for other countries and organizations to take these potential issues into account.

In 2007, Russia waged a cyber attack on e-Estonia by hacking into the online bank servers and disabling cash machines (First 'Digital' Country). In order to provide a better defense system, Estonian engineers added blockchain technology to their server so that they could better protect their public services and citizens' personal information (Digital Society). Although there has not been a huge data breach yet, some experts suggest that e-Estonia is still too vulnerable. One researcher from the University of Michigan claims that there are problems with Estonia's online voting system and suggests that the country should immediately switch over to an in-person voting system (First 'Digital' Country). However, Estonian officials are still confident in their cybersecurity technologies and are continuing to hold their elections online (First 'Digital' Country). Even with the potential cyber attack threats, Estonia still urges other countries to follow their lead and switch to e-governance systems. However, in larger and more diverse countries, it would be harder to set up effective online governments that could cater to different languages and internet accessibilities (First 'Digital' Country). In addition to this, larger countries would risk larger data breaches if anything went wrong. Although e-governance has worked quite smoothly in Estonia, that does not necessarily mean that it can be applied to all other countries.

Estonia has made huge leaps of progress in developing the world's first e-state. However, with all the conveniences that come along with an online world, there are still some negative factors, including cybersecurity breaches and the feasibility of using these systems on larger scales. As more countries and organizations adapt to the online world, it is crucial that they focus in on these potential problems to ensure a safe and secure environment for their constituents.

QUESTIONS TO CONSIDER

Question 1: How can smart cities address the "digital divide", which is the social and economic inequalities which come about as a result of who has access to communication technology, and how they use it.

Question 2: How does each countries stance on data protection affect its smart city policy regarding the UN's principles of data protection

Question 3: How will any plan made address the disconnect that occurs between country specific policy, technology, and economy in order to create a set of initiatives that are universal?

Question 4: How has the rise in big data led to the rebirth of smart cities? How does your country utilize data?

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