Neutral fibre and the European Green Deal

How can dark fibre support the sustainability agenda?

WIK-Consult

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Context

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- 2019 European Green Deal establishes the Commission's commitment to tackling climate and environmental challenges
  - Key target to reduce EU greenhouse has emissions by at least 50% compared with 1990
  - Achieving targets will require reductions in emissions from transport and buildings as well as other sectors
- ICT can play an important role in its own right as well as enabler of energy efficiency in other sectors
- Sweden is a European leader in energy efficiency
- Taking Stockholm as a case study, we explore sustainable technologies and use cases

Stockholm: A model for green deal

"The City Council of Stockholm has adopted the strategy to become the world's smartest city."

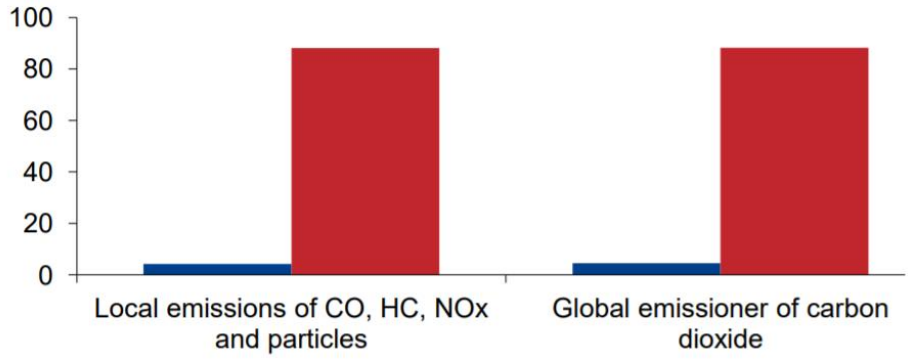
Deputy CEO Staffan Ingvarsson, City of Stockholm

- Stockholm has set target to become **climate positive by 2040**
- Strategy is underpinned by the City's dark fibre network, Stokab
- Key elements of strategy:
  - Energy-efficient FTTH technology
  - Spare capacity for future deployment (avoids digging)
  - Node system limiting energy use for BB providers
  - Re-use of energy for district heating
  - Platform for digitisation

Focus on transport:

More sustainable transport

In the first week of trials of dynamic traffic light controls in the Stockholm area, buses experienced 25% faster driving times.

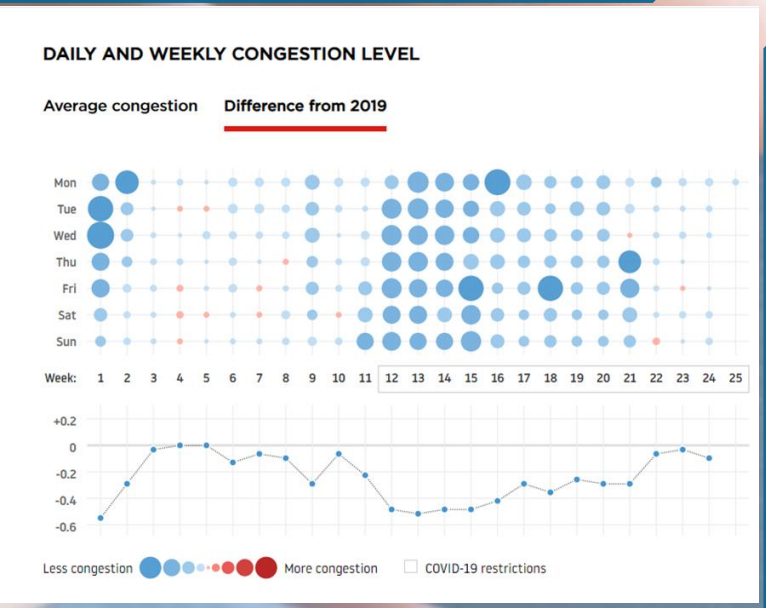


The graph above shows the difference in emissions of CO, HC (hydrocarbons), NOx, particles and SO2in another residential area in Stockholm (Stora Ursvik). UWT stands for underground waste transportation and Conventional stands for bin collection with rear loading lorry.

- The City of Stockholm is engaged in various digital initiatives to address congestion and pollution in the city
- One example is the “Smart Waste Handling System” reducing waste collection traffic by 90%
- Another ambition is to connect with fibre and digitize the traffic light system. Applications include:
  - Dynamic light changes to prevent traffic jams
  - Priority for public transport vs private vehicles
  - Enforcing traffic restrictions / congestion charging
  - Digital data capture to improve design of traffic intersections

Focus on transport:

Reducing transport needs



Source: Tomtom

"***Municipalities have already implemented technological solutions and the advanced network infrastructure in many Swedish cities made it easy to move from physical to virtual meetings***". ***(Microsoft)***

- Studies show effective broadband is a key enabler of home working and learning
- Sweden benefited from high rates of teleworking – even pre-COVID (37% working age adults in 2019 - Eurostat)
- During the COVID first wave congestion levels in Stockholm fell to 50% usual values (TomTom) due to home working and eLearning
- Likely to have impacted emissions (study found decline of 15% in traffic-related emissions found globally Jan-Apr 2020)
- City observes that pandemic has shown that unnecessary travel can be avoided through digital meetings or working hubs around city

Health and education:
Some surprising effects

- COVID was also associated with greater reliance on remote learning and healthcare with some surprising positive effects

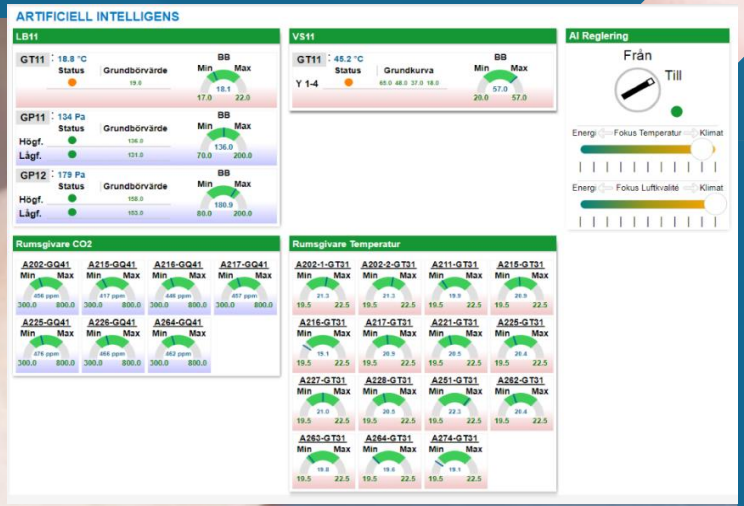
"An interesting finding was that students that previously hadn't come to school participated more. More students joined in when classroom turned digital turned up than before. Schools found the positive results a real eye-opener." (Ann-Marie Taylor, CIO at Department of Education, City of Stockholm)

The number of healthcare video meetings between January 2020 and April 2020 increased by 1000%, from 3.300 video meetings in January to 40.000 video meetings in April.

Due to COVID-19, it was possible to observe that many things in healthcare are possible online – more than one might think. E-health is cost-effective for society as patients do not have to travel and can continue to work from home. Online meetings also had a positive impact on the working environment of medical personnel, as it meant they could optimise their appointments between physical and virtual meetings
Daniel Forslund, Commissioner for Innovation and eHealth for the Region of Stockholm

Smart buildings:

Cutting costs and energy

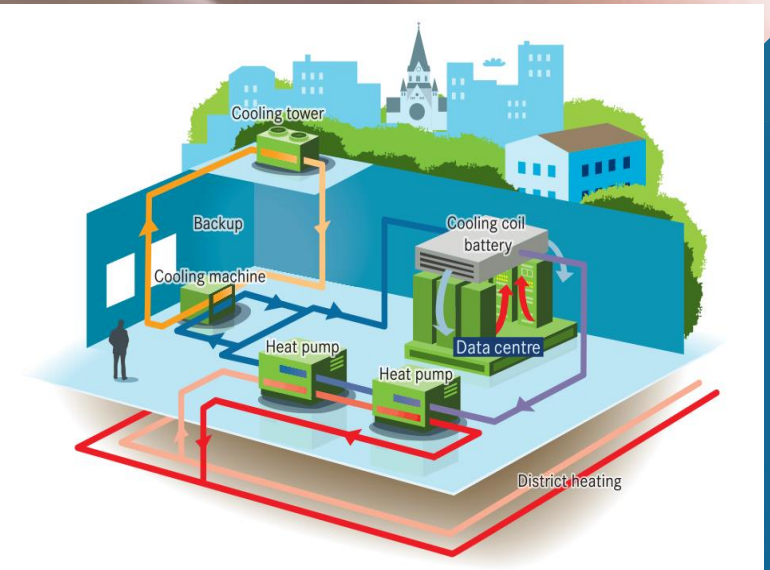


"Between 2012 and 2019 Sisab was able to save 35% of energy, equaling 18,500 tons of CO2 or 4 million Euros per year" (Niklas Dalgrip, Chief Operations Department at Sisab)

- Building and construction accounts for 39% global CO2 emissions
- Key source is heating and air conditioning as well as IT equipment (in offices / public buildings)
- Fibre supports smart building solutions in Stockholm's 600 schools
- 200,000 sensors and 6 weather stations support efficient heating
- Sensors also enable targeted maintenance via graphical interface in each school
- Further 4% energy savings (15% on heating) possible with support of AI

Smart heating:

Re-using heat from data / telecoms

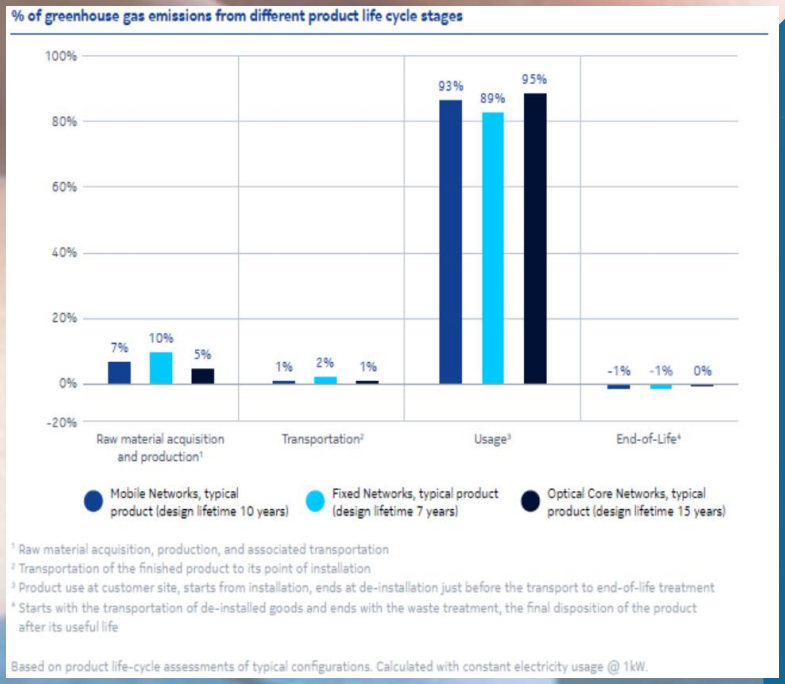


"There is huge potential from re-using energy from data centres. Last year at Stockholm Data Parks, we recovered 124 GWh from data centres, enough to serve 34,000 modern residential flats" (Erik Rylander, Head of Stockholm data parks)

- Stockholm Data Parks launched 2017 with support from City of Stockholm and utilities
- Targets smaller scale data centres in cities with capacity of 10-20MW
- 10MW data centre can meet heating needs of around 20,000 modern residential apartments
- Avoids need to use polluting sources of energy
- Heat recovery enabled Stockholm Exergi to close the last coal-fired heat generating plant in Sweden in Spring 2020
- Single buildings can also benefit if no district heating. Stokab's largest core node uses 1,000 MHWh of electricity per year – used to supply school covering area of 11,000 sq m with heating and hot water

Impact of technologies:

Fibre as energy efficient solution



Source: Nokia (2020)

- Fibre is more energy efficient at every stage of its life cycle
- 1,000 Kg CO2e to extract copper for 200 foot wire vs only 0.06 KgCO2e for fibre (Corning)
- Network operation accounts for greatest proportion of telecoms GHG emissions (Nokia)
- FTTC consumes 1.5x power of FTTH PON (Baliga 2011)
- For high bandwidths PtP FTTH consumes less energy per Gigabit than FTTH PON and DOCSIS
- Fibre most efficient solution for IoT applications requiring high data rates (LTE < WiFi < wired solns) (Gray 2015)

WIK calculations (2020) show a complete migration from current technology mix in EU to full fibre would reduce power consumption and GHGe by 80% (PON) or >90% (PtP)

Knock-on effects

ICT impact on sustainable solutions

"*Better building design, management and automation could save 15% of North America's buildings emissions, while globally, smart buildings technologies would enable 1.68 GtCO2e of emissions savings*" (The Climate Group)

*"The real game-changer will be electric and driverless cars and trucks. 5G is a pivotal technology for safety, efficiency and reliability in this space. Driverless vehicles will accelerate a shift in the traditional business model of vehicle ownership towards mobility and transportation as a service… Such a sustainable and cost-competitive solution may replace more than 60% of today's transport impact. Einride estimates the CO2 reduction potential per pallet of freight when transitioning from diesel to electricity to be 90% for countries with a low-carbon electricity mix, like Sweden." (*Ekholm, Rockström, 2019)

Conclusions and recommendations

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- Focus on impact of ICT previously primarily on social and economic effects
- Environmental effects should also be considered
- Possible actions / change in emphasis
  - Take into account energy efficiency in the context of public funding or other support
  - Make consumers aware of energy efficiency (e.g. in the context of labelling schemes)
  - Facilitate transition to all-fibre and copper switch-off
  - Role for municipalities and (where deployed) municipal networks in supporting sustainable deployment?

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