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# INTERNATIONAL WEBINAR

"The Impacts of Covid-19 on the Sustainable  
Development of Cities and Settlements"



# Sustainable Energy Development in Urban Buildings During COVID-19 Pandemic

**Charles O.P. Marpaung**  
Universitas Kristen Indonesia

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# Outline

- Energy and building
- Covid-19 and its impacts
- Towards Zero Energy Building (ZEB) or Nearly Zero Energy Building (nZEB)
- Conclusions

# Energy and Building (1)

- Buildings are a very large sector consuming energy.
- In the United States (U.S.), buildings account for 39% of total energy consumption and 72% of total electricity consumption.
- In the EU, energy consumption in the building sector in 2012 was 40% of final energy consumption.
- The International Energy Agency (IEA) notes that existing buildings consume 40% of the world's total energy and produce CO<sub>2</sub> emissions of 40% of total global CO<sub>2</sub> emissions.
- In most countries, the contribution of old buildings (those > 30 years old) is more than 60% of existing buildings. Old buildings are buildings that are not efficient in energy use.

# Energy and Building (2)

- Therefore, when environmental problems become increasingly significant, energy saving interventions in buildings to become more energy efficient buildings (or nearly zero energy building or nZEB) are very important to substantially reduce the negative impact of buildings on the environment and the economy.
- The most feasible and cost-effective method for increasing the energy efficiency of buildings is "energy retrofit".
- Energy retrofitting is a physical or operational change in the building itself, the equipment that consumes energy, or the behavior of its occupants to reduce the amount of energy needed and convert the building into a lower energy facility.

# COVID-19 and Its Impacts (1)

- The corona virus disease (COVID) – 19 pandemic outbreak has almost touched everyone's life and is affecting every sector in the economy.
- This outbreak was first identified in Wuhan, China, in December 2019 and continues to this day in all parts of the world.
- The impact of the Covid-19 pandemic outbreak is the daily routine life has come to a standstill, many sectors such as businesses, transport, and many more industries have come to a halt.
- During the lockdown (i.e., limited restriction, partial lockdown, full lockdown) curtailment in many activities such as mobility, economic activity, construction and manufacturing, dropped the global energy demand.

# COVID-19 and Its Impacts (2)

- The decline in energy demand and consumption brings damage to the energy industry.
- Only essential sectors like healthcare, food and beverages, energy, communication and IT, financial, logistics, construction, strategic industries, basic services and public utilities, business sectors that serve daily needs have been permitted to operate (Pergub DKI No. 33/2020).
- Many countries include Indonesia-imposed curfew, mandatory stay-in-home orders and lockdown of cities and countries.
- Due to the forced restrictions “stay in home”, the daily needs of the people would be affected, one of them is the energy consumption in the residential buildings.

# Aims of Discussion

- To explore lessons learned to tackle a continued increase in energy consumption in urban buildings in case of continued COVID-19 or future pandemics or other extreme events that might happen.
- To explore various innovations how SDG2030 can be achieved from urban buildings perspective

# Sustainable Energy Development

SDG-2030

- SDG7, SDG11, SDG13
- Energy Transition





# Change of Energy Demand Due to Corona Virus

- During lockdown, the demand for energy declines
- After relaxing lockdown measures, the demand for energy gradually increases
- The decline of energy demand would decline again as the second wave of pandemics has been on the way
- Energy demand in commercial and industrial decline, but the energy demand in residential and health and emergency services increase
- Load curve also changes

# Impacts of The Reduction in Energy Demand on The Supply Side

- Change in generation mix
- Change in cost of producing electricity
- Environmental impact

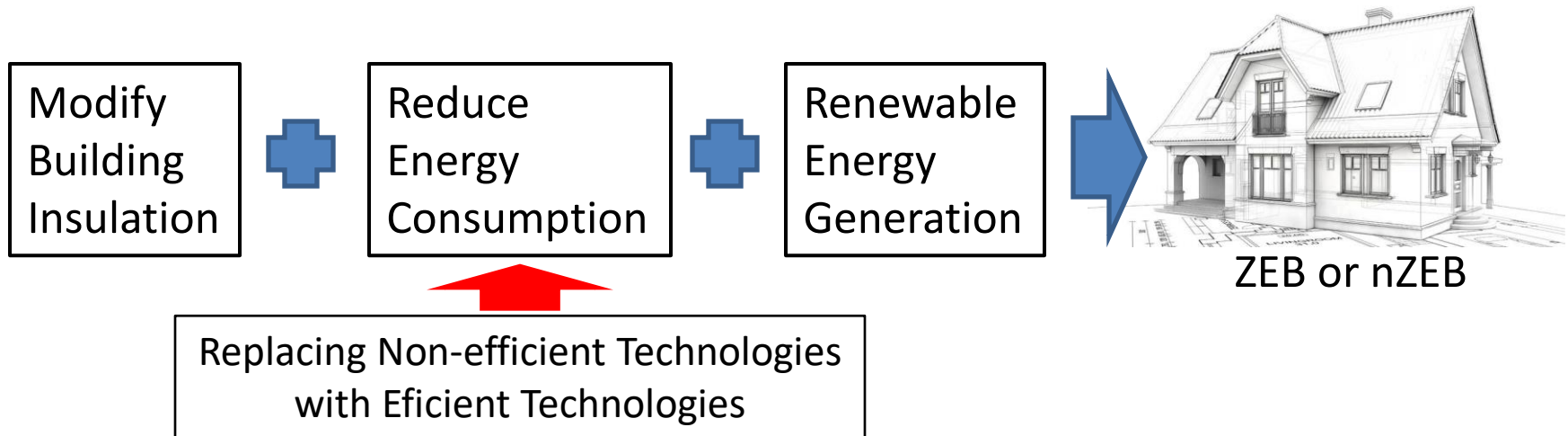
# Types of Buildings Based on Their Functions

Kelompok	Fungsi
Residential	Dwelling
Office	Office, Council Office, Government Office, Business Park, Financial and Professional Services
Retail	Shopping , Shopping Centre, Supermarket, Superstore, Retail Park, Market
Local Service	Bank, Chemist, Community Centre, Post Office, Church, Mosque, Synagogue, Laundrette, Library, Youth Centre
Leisure-Restaurant	Art Centre, Bing Hall, Cafe, Bar, Museum, Restaurant, Public House, Take Away, Nightclub, Public Baths
Education	School, Nursery, Primary School,, Secondary School, University, Further Education College, High School
Health and Emergency Services	Hospital, General Hospital, Dental Hospital, Fire Station, Police Station, Children's Hospital
Hotel-Accomodation	Hotel, Guest House, Hostel, Youth Hostel, Motell, Inn
Industrial	Factory, Manufacturing, Industrial Estate, Electricity Sub Station
Transport	Bus Station, Coach Station, Ralway Station, Filling Station, Garage
General Commercial	General Commercial

# Why The Demand for Energy Increases in Residential Building

- Forced lockdown and stay at home orders
- Life style (Covid-19 changes the work and living habits)
- Daily activities
- The duration of using electrical appliances (especially energy intensive electrical appliances)

# How to Achieve Zero Energy Building (ZEB) or Nearly Zero Energy Building (nZEB)



There are three main solutions to improve Energy Performance in buildings, namely:

- ✓ Modify the walls of the building (building insulation);
- ✓ Reducing energy consumption;
- ✓ Promote on-site energy production by utilizing renewable energy sources.

# Energy Supply and Energy Consumption in Buildings (1)

- Energy Supply:
  - Roof top solar
  - Building Integrated Photovoltaic (BIPV)
  - Building Integrated Wind Turbine (BIWT)
  - Microgrid System (Renewable Energy)
    - Not connected to the main grid
    - Connected to the main grid
  - Main Grid (or National Grid)

# Energy Supply and Energy Consumption in Buildings (2)

- Reduce energy consumption in buildings:
  - Energy efficient technology used
  - Modify building insulation
  - Installing Energy Management and Information Systems (EMIS)

# Some of Our Research Projects

- Upaya Efisiensi Energi Dengan Bantuan Simulasi Autodesk Insight360 Pada Unit Rusunami di DKI Jakarta (*Energy Efficiency Efforts with Autodesk Insight360 Simulation Assistance at Low Cost Housing Unit in DKI Jakarta*)
- Optimasi Façade Gedung Dengan Konsep Bangunan Hijau (*Façade Building Optimization with a Green Building Concept*)



# Conclusions

- At national level, Covid-19 pandemic reduces the demand for energy, and accordingly reduces the CO<sub>2</sub> emissions
- At sectoral level (residential buildings), Covid-19 pandemic increases the demand for energy, and accordingly increases the CO<sub>2</sub> emissions
- The energy consumption in residential buildings can be reduced through energy efficiency programs and introducing renewable energy

*Thank You*

# Energy in Buildings

# Energy Demand in Building

- During normal operations and extreme events (e.g., Covid-19 Pandemic)

- To date, the demand/consumption changes from both macro and micro scales are highlighted as follows:
  - The short-term demand declines when implementing lockdowns [14], but the demand is expected to recover gradually after relaxing lockdown measures [20]. The decline-recovery dynamics would go on as the second wave of pandemics has been on the way.
  - Traditional fossil energy demand declines, but renewable energy demand increases [6]. The energy variations in different sectors, including renewable, nuclear, gas, coal, and oil, are significant [6], which is discussed in detail in Section 5.2.
  - Commercial and industrial demands decline, but residential demand increases [25].
  - In the district level, the thermal energy demand of buildings declines, but the electricity demand of buildings increases [26].
  - The peak time for electricity demand also changes. For example, the peak time of pre-pandemic occurred in the latter week (Wednesday to Friday), whilst that of post-pandemic was observed in the earlier week (Monday to Tuesday) in Ontario, Canada [27].
  - The demand in the regular morning peak time declines [28], but that in the potentially new peak time might increase [29].
  - The consumption of private cars declines during the lockdown, but that increases sharply after lifting the lockdown [30]. What might be worse is that 56.3% of respondents would decrease the usage of buses post-COVID-19 [31].

# How to explore sustainable energy development can be achieved in urban buildings

- This Webinar thus aims to explore how South Asia tackled and plans to navigate from the 'plastic pandemic' by discussing:
- **1. challenges** faced by the region to manage COVID-19 induced plastics and plastic packaging waste
- **2. innovations** adopted by the region (product, technology, financing and business model optimization etc.) for achieving a sustainable plastic and packaging waste management
- **3. lessons** learned by the region to tackle a continued surge in plastics in case of continued COVID-19 or future pandemics

- People with ideas are dreamers. People who get things done are doers. One doer is worth eight dreamers. There are three kinds of people who make up an innovator.
- There are **inventors** (people who have new and unique ideas), **problem solvers** (people who have ideas about how to correct a previous error) and **entrepreneurs** (people who transform ideas into realities).
- Put them altogether they spell "innovator."

- Normal operations
- Extreme events (eg., Covid-19 Pandemic)



- Mitigate rising household energy consumption
- Improve energy efficiency
- Resilience of residential buildings

# Sustainable Energy Development in Buildings

# Impact of COVID-19 Pandemic on Energy Consumption in Buildings