Circular Carbon Economy (CCE):

Future Opportunities

Fareed ALASALY
October 7, 2020
6. Building upon previous comments made by the G20 Energy Ministers in past Presidencies, we endorse the Circular Carbon Economy (CCE) Platform and its “4Rs” framework (Reduce, Reuse, Recycle and Remove) while acknowledging (Appendix I) and recognizing the key importance of reducing greenhouse gas emissions, taking into account system efficiency and national circumstances, including its specific resources endowment and its political, economic, environmental, social, and risk-informed development contexts, noting:

a. Reduce: Lower GHG emissions by utilizing technologies and innovations such as renewable energy and nuclear energy, improving energy productivity and efficiency, and better managing energy supply and consumption.

b. Reuse: Convert emissions into useful industrial feedstock by deploying Carbon Capture and Utilization (CCU), including Emissions to Value (E2V) and Carbon Recycling (CR). Noting the potential of CCU as an advanced and cleaner technology that can help mitigate the impacts of emissions by capturing and reusing them;
6. Building upon previous comments made by the G20 Energy Ministers in past Presidencies, we endorse the Circular Carbon Economy (CCE) Platform and its “4Rs” framework (Reduce, Reuse, Recycle and Remove) while acknowledging (Appendix I) and recognizing the key importance of reducing greenhouse gas emissions, taking into account system efficiency and national circumstances, including its specific resources endowment and its political, economic, environmental, social, and risk-informed development contexts, noting:

c. Recycle: Neutralize carbon emissions through natural processes and decomposition, including through the use of renewable sources of energy such as biofuels, bioenergy and energy carriers such as methanol, ammonia, and urea representing the natural cycle and the recycling; and

d. Remove: Remove emissions from the atmosphere as well as from heavy industries and facilities through Carbon Capture and Storage (natural and geological) and Direct Air Capture.
Circular Carbon Economy (CCE)

CCE Platform:
- Approach
- Opportunities
- Accelerator

CCE Application

Concluding remarks
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Concluding remarks
KSA promotes CCE, a pragmatic approach, that utilizes all available levers to address emissions while generating value (i.e. GDP, employment).

**Linear carbon economy**

- Emissions

**Circular Carbon Economy (The 4 Rs)**

1. **Reduce** need forcombusting hydrocarbons
   - Energy Efficiency
   - Renewable energy
   - Low carbon fuels
   - Carbon mgmt. in agro-ecosystems

2. **Capture** emissions for other applications
   - Food and beverages
   - Supercritical CO₂
   - EOR

3. **Produce** new products
   - Carbon to polymers / chemicals
   - Carbon to fuels
   - Carbon to other materials

4. **Reuse** carbon emissions from atmosphere
   - Direct air capture with storage
   - Mineralization and storage
   - Nature based solutions

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Note: [1] EOR: Enhanced Oil Recovery
The 3 Rs of the Circular Economy

**REDUCE**
Reduce the amount of waste entering the system

**REUSE**
Convert waste to another useful industrial feedstock

**RECYCLE**
Recycle waste through natural processes, decomposition and combustion

1970s
The 3 Rs in the context of waste management

1990s
The 3 Rs were used to apply to the broader circular economy
The 4 Rs of the Circular Carbon Economy (CCE)

REDUCE

REUSE

RECYCLE

REMOVE
The 4 Rs of the Circular Carbon Economy (CCE)

**REDUCE**
Reduce the amount of emissions entering the system

- Energy efficiency
- Renewables
- Nuclear power

**REUSE**
Convert emissions to another useful industrial feedstock

- Carbon Capture and Utilization (CCU) / Emissions to Value (E2V)

**RECYCLE**
Recycle emissions through natural processes, decomposition and combustion

- Bio-energy
- Hydrogen

**REMOVE**
Remove emissions from the system

- Carbon Capture and Storage (CCS)
- Direct Air Capture
The 4 Rs of the Circular Carbon Economy (CCE)

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- Energy efficiency
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- **REDUCE**: Reduce the amount of emissions entering the system
- **REUSE**: Convert emissions to another useful industrial feedstock
- **RECYCLE**: Recycle emissions through natural processes, decomposition and combustion
- **REMOVE**: Remove emissions from the system

**REDUCE**
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- Nuclear power

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CCE Application

Concluding remarks
Circular Carbon Economy (CCE) Platform: **Approach**

The CCE is a holistic, integrated and inclusive approach based on the 4Rs strategies that contributes to sustainable development and economic growth which value all sources, sectors, and options.
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**Reduce**
- Energy Efficiency (EE)
- Non-Biomass Renewables (RE)
- Nuclear (NU)

**Reuse**
- Carbon Capture and Utilization (CCU)
- Emissions to Value (E2V)
- Carbon Recycling (CR)

**Remove**
- Direct Air Capture (DAC)
- Carbon Capture and Storage (CCS)

**Recycle**
- Bioenergy (BI)
- Biomass and biofuels (BB)

**Cross-cutting: Hydrogen (HY)**
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**Remove**
- Direct Air Capture (DAC)
- Carbon Capture and Storage (CCS)

**Cross-cutting: Hydrogen (HY)**

**Environment**
Manage emissions from all sectors, including but not limited to energy.

**Social**
Contribute to poverty eradication, employment and standards of living.
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Economic:
Advance economic growth and sustainable recovery

Social:
Contribute to poverty eradication, employment and standards of living

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Remove:
- Direct Air Capture (DAC)
- Carbon Capture and Storage (CCS)

Recycle:
- Bioenergy (BI)
- Biomass and biofuels (BB)

Economic
Advance economic growth and sustainable recovery

Social
Contribute to poverty eradication, employment and standards of living

Technology
Grounded on technology and innovation while utilizing all sources and options

Environment
Manage emissions from all sectors, including but not limited to energy

Cross-cutting: Hydrogen (HY)
Circular Carbon Economy (CCE) Platform: Opportunities

Elements include: i) high-level impact opportunities
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Circular Carbon Economy (CCE) Platform: **Accelerator**

Elements include: i) high-level impact opportunities, and ii) the CCE Accelerator, which create the framing and potential vehicle to action the opportunities.
Circular Carbon Economy (CCE) Platform: **Accelerator**

*Elements include: i) high-level impact opportunities, and ii) the CCE Accelerator, which create the framing and potential vehicle to action the opportunities*

- Plans
- Strategies
- NDCs
Circular Carbon Economy (CCE) Platform: Accelerator

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Concluding remarks
Total Emissions

- Energy: 41%
- Non-energy: 59%

Cleaner Energy Systems:
- Renewables
- Energy Efficiency
- Nuclear power
- CCU / E2V
- Bio-energy
- CCS
- Direct Air Capture

Non-energy sectors contributed to approximately two-third of global emissions, which can be addressed through the Circular Carbon Economy approach at various levels:
- Product level
- Industry level
- Sector level
- National level

Source: IEA Global CO2 Emissions by Sector, 2017. The 41% share for Energy includes Electricity & Heat Generation according to the IEA methodology.
Application

➢ Energy

➢ Mobility

➢ Building

➢ Industry:
  ▪ Cement
  ▪ Petrochemical
  ▪ Steel

➢ Agriculture

➢ Livestock
➢ Circular Carbon Economy (CCE)
➢ CCE Platform:
   ▪ Approach
   ▪ Opportunities
   ▪ Accelerator
➢ CCE Application
➢ Concluding remarks
Concluding remarks

- CCE Approach contributes to Sustainable Development, including climate;
- Builds on the “Circular Economy”;
- Advance technology innovation;
- Transforms the emissions challenge to business opportunities;
- Values all options and technologies;
- Covers all economic sectors
- Promotes integrated business models;
- Provide collaborative platform;
- Accounts for local and national context;
- Contributes to economic growth; and
- G20 has endorsed the CCE Platform as framework to advance sustainability.
THE SYNERGY OF THE CIRCULAR CARBON ECONOMY APPROACH: For Economic Growth
Thank you