Introduction of 『Clinker Road』
~ Sustainable city/town development using coal ash~
What’s this?
What is coal (fly) ash?
What is Coal (fly) ash?

**Generation rate/amount of coal ash**

(Kyushu Electric Power Company)

- **Landfill**
  - (120,000t)
  - 20%
- **Recycle**
  - (480,000t)
  - 80%

Web: Kyushu Electric power Co.
What is Coal (fly) ash?

Power generation rate in China

- Coal: 79%
- Others: 21%

web: J-Power
What is Coal (fly) ash?

Power generation rate in U.S. A.

- **Coal**: 43%
- **Others**: 57%

web: J-Power
What is Coal (fly) ash?

Power generation rate in the world

- Coal: 41%
- Others: 59%

web: J-Power
People hate coal ash?

paved roads that allow air to pass through to ground

Clinker Road
Industrial waste: reborn to environmentally friendly pavement!
Effect of global warming - guerrilla thunderstorm
Effect of global warming - guerrilla thunderstorm
Effect of global warming - guerrilla thunderstorm
Effect of global warming - guerrilla thunderstorm
## Effect of global warming – increased no. of extremely hot days

<table>
<thead>
<tr>
<th>Order</th>
<th>Observation point</th>
<th>Average temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fukuoka city (Chuo-ku)</td>
<td>30.0°C</td>
</tr>
<tr>
<td>2</td>
<td>Kitahara, Kubejima-cyo, Okinawa</td>
<td>29.6°C</td>
</tr>
<tr>
<td>3</td>
<td>Ishigaki city, Okinawa</td>
<td>29.5°C</td>
</tr>
<tr>
<td></td>
<td>Itoshima city, Fukuoka</td>
<td>29.5°C</td>
</tr>
<tr>
<td>4</td>
<td>Kagoshima city</td>
<td>29.4°C</td>
</tr>
<tr>
<td></td>
<td>Naha city, Okinawa</td>
<td>29.4°C</td>
</tr>
<tr>
<td></td>
<td>Kumejima, Kubejima-cyo, Okinawa</td>
<td>29.4°C</td>
</tr>
<tr>
<td></td>
<td>Aguni village, Okinawa</td>
<td>29.4°C</td>
</tr>
<tr>
<td>5</td>
<td>Amami city, Kagoshima</td>
<td>29.2°C</td>
</tr>
<tr>
<td></td>
<td>Yoron-cyo, Kagoshima</td>
<td>29.2°C</td>
</tr>
</tbody>
</table>
Effect of global warming – increased number of extremely hot days.
Essential item to create future cities & towns
"Breathing model" of Clinker Road

Rainwater circulation

(quick) Water permeability

(voluminous) Water retention

(slow) drainage

- 50% of volume of water is retained

Groundwater

- 4 hours after sprinkle of water
- D method - water cement ratio
- -18.5°C

Prevention of flood damage

No anxiety

moisture

Prevention of heat-island

absorbed

discharged

breathe
Power of “Clinker road”
### Power of “Clinker road”

<table>
<thead>
<tr>
<th>Water retention</th>
<th>Concrete</th>
<th>Product of a competing company</th>
<th>Clinker Road</th>
</tr>
</thead>
<tbody>
<tr>
<td>20cc</td>
<td>70cc</td>
<td>250cc</td>
<td></td>
</tr>
</tbody>
</table>

The diagrams illustrate the water retention capacity of different materials, showcasing the superior performance of Clinker Road compared to concrete and a competing product.
Ideal places of using Clinker Road

- private gardens
- historical parks
- theme parks
- slopes
- roadside trees
- median strips
- transmission line towers
- mobile phone base stations
- mega solar power plants
Sustainable city/town development using coal ash

【prevention of global warming/ urbanisation】
- guerrilla thunderstorm, urban type flood
- Heat-island
- Relief, moisture
- Environmental conservation
- landfill treatment
- Coal (fly) ash

【Environmentally friendly】
- paved roads that allow air to pass through
- High water absorbency
- Water permeability
- Recycling technology
- Water retention
- Durability

Prevent flood disaster
Prevent air temperature to increase
No puddles
Prevent grass
### Experience of construction

<table>
<thead>
<tr>
<th>Year</th>
<th>Construction area (m²)</th>
<th>Used amount of coal ash (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>7,800</td>
<td>390</td>
</tr>
<tr>
<td>2010</td>
<td>9,600</td>
<td>480</td>
</tr>
<tr>
<td>2011</td>
<td>15,500</td>
<td>770</td>
</tr>
<tr>
<td>2012</td>
<td>6,300</td>
<td>320</td>
</tr>
<tr>
<td>2013</td>
<td>7,000</td>
<td>350</td>
</tr>
<tr>
<td>2014</td>
<td>10,000</td>
<td>700</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>56,200</strong></td>
<td><strong>3,010</strong></td>
</tr>
</tbody>
</table>
Thank you,