
Thursday, July 19 2018
6th Floor
Progress and Prospects:
in China’s Transition toward Sustainable Cities

Introducing the China Low-Carbon and Green for Cities Index (LOGIC)

Innovative Green Development Program (iGDP)
China Energy Group of Lawrence Berkeley National Laboratory
Energy Foundation China

Presentation for HU Min, iGDP
Wilson Center
About iGDP

• An independent Chinese think tank working on:
  • Green and Low-Carbon City
  • Green Economy
  • Climate Change

• The implementation organization of the Green Low-Carbon Development Think Tank Partnership (GDTP):
  • A network of 45 local research institutions that have been providing technical support for subnational green low-carbon development

• Please visit us at www.igdp.cn.
Cities’ Green and Low-carbon Development Challenges

- A Guidebook for Strategic Planning and Actions
- Scientific-based Planning
- Effective Policy Implementation
- Policy Mapping Database
- Integrated Policy Evaluation

LOGIC Report and Tool
A Guidebook for Strategic Planning and Actions

Preliminary Setting Up

Evaluation and Upgrade

Plan Drafting

Plan Drafting

Complementary Measures

- Models
- Case Studies
- Benchmarking
- Gap Analysis

Identify and Select Policies and Technologies

- Marginal Cost Analysis
- Cost Curve Analysis
- The analytic hierarchy process (AHP)
- Roadmap Drafting
- Policy Mapping

Target Setting and Allocation

- Model: CGE, LEAP, AIM, STOCK, KAYA, TIMES, LDMI, STRPA

Assess Current Situation

- Energy Balance Sheet
- GHG Inventory
- Benchmarking
- Case Studies
- Peer Comparison

Tool Manual
Policy Mapping

www.cepm.igdp.cn

- 10 major indicators
- 46 secondary indicators
- 77 detailed indicators

- Synthesis and integrated info.
- Status quo and outlook
- Best Practice

36 Low-Carbon Pilots
APPCC Cities
7 Major Industries
300+Policies and Measures
Low-Carbon and Green for Cities Index (LOGIC)
A KEY QUESTION:

Are China’s cities making progress on their green and low-carbon goals?
China’s cities are getting greener:
Overall LOGIC Index scores improved 6% from 2010-2015
Chinese Cities are seeing **Green Growth**: Over 90 cities saw both GDP growth and LOGIC Index growth from 2010-2015.
China's Low-Carbon Pilot Cities show the way:
Pilot cities have been quicker and more successful in achieving green & low-carbon results...

Pilot cities have higher average scores...

<table>
<thead>
<tr>
<th>Average Index Score</th>
<th>2015</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot Cities</td>
<td>47.0</td>
<td>42.9</td>
</tr>
<tr>
<td>Non-Pilot Cities</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Pilot cities have scores in a higher range....

Index Score

And, pilot cities’ scores are improving faster.

Index Score

2010 2015
Adapting existing tools:

- BEST Cities model (LBNL)
- ELITE Cities model (LBNL)
- Policy Mapping (iGDP)

Building off a strong foundation...

Learning from international and domestic city indicators:

Three Types of Existing City Indicator Systems

- Systems adopted by China national-level agencies
- International systems
- Systems developed by research institutes

A New Index: LOGIC
A NEW AND UNIQUE CITY INDEX DESIGNED FOR CHINA’S LOW-CARBON URBAN AND ECONOMIC TRANSITION

FOCUS ON KEY ECONOMIC & SOCIAL FACTORS
- Group and evaluate cities according to development
- Three economic groups
- Three city-size groups
- Four regional groups
- Status of low carbon pilots

REFLECTS RECENT POLICY EFFORTS
- Four policy indicators
- Assess efforts and new actions

TRACKS LOW-CARBON PERFORMANCE
- 19 quantitative indicators, across key urban sectors
- Tracking real low-carbon performance
- Reflect China’s urban economies and industry

DEFINED USING GLOBAL BENCHMARKS
- Assess performance against China + Global best practice
- Guide the path forward
Why a new indicator system?

- Recent fast change in China’s low carbon polices + actions
- China’s economic and urban policies are unique
- Rely on publicly available city data in China
- Holistic Green + Low-Carbon assessment + Energy
How does the Index Work?
Inside the Index: LOGIC Methodology

Select & Group Cities → Define Index Framework → Normalize by Benchmarks → Assign Weights → Calculate Scores
74% of National GDP
52% of National Population
58% of National Energy Consumption

115 Cities, accounting for:

**METHODOLOGY:**
City Selection and City Grouping

4 Groupings of Cities for analysis:
- Economic Groups
- Size Groups
- Geographic Regions
- Low-Carbon Pilot Status
## METODOLOGY:

Index Framework and Weighting: Categories + Indicators

### 7 Categories / Sub-Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economy</td>
<td>20%</td>
</tr>
<tr>
<td>Energy &amp; Carbon</td>
<td>50%</td>
</tr>
<tr>
<td>Environment &amp; Land Use</td>
<td>20%</td>
</tr>
<tr>
<td>Policy &amp; Outreach</td>
<td>10%</td>
</tr>
</tbody>
</table>

### 23 Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Weight</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

\[\sum = 100\%\]
**Methodology:**

Benchmarking Performance against Global Best Cities

**Benchmarking Principles:**
- **Meaningful Measures** – connect to green & low-carbon goals
- **Ambitious** – future looking, and goal stretching
- **International** – connect to best cities, and other indices

**Three Types of Benchmarks:**
- **International Best Practice**
- **China Policy Targets**
- **+20% Better than Best City in Sample**

- **Directly Proportional**
  \[ S \sim \frac{D}{BM} \times 100 \]

- **Inversely Proportional**
  \[ S \sim \frac{BM}{D} \times 100 \]
Inside the Index: LOGIC Methodology

Select & Group Cities

Define Index Framework

Normalize by Benchmarks

Assign Weights

Calculate Scores
EXPLORING LOGIC INDEX RESULTS:

Which index dimensions are most important?
Which types of cities perform the best?
Chinese cities have significant potential to improve their Green and Low-Carbon performance.

<table>
<thead>
<tr>
<th>Category</th>
<th>Average Score</th>
<th>Gap from Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment &amp; Land Use</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Energy &amp; Power</td>
<td>9.3</td>
<td>8.7</td>
</tr>
<tr>
<td>Industry</td>
<td>7.2</td>
<td>10.8</td>
</tr>
<tr>
<td>Economic Dimension</td>
<td>5.1</td>
<td>14.9</td>
</tr>
<tr>
<td>Buildings</td>
<td>4.7</td>
<td>3.3</td>
</tr>
<tr>
<td>Policy Dimension</td>
<td>4.3</td>
<td>5.7</td>
</tr>
<tr>
<td>Transportation</td>
<td>2.3</td>
<td>3.7</td>
</tr>
</tbody>
</table>

60% of category benchmark

52% of category benchmark

40% of category benchmark

26% of category benchmark

38% of category benchmark
Exploring Results
LOGIC Index Indicators

**Category Scores Histogram**
115 sample cities’ distribution

**Indicator Scores vs Benchmark**
3 indicators in E&P category
115 sample cities

**Indicator Scores Histogram**
One indicator from E&P category
115 sample cities’ distribution

- **Energy Consumption / capita**
  - Score: 4.2
  - Gap from Benchmark: 1.8

- **Non-Fossil Fuel Energy**
  - Score: 3.1
  - Gap from Benchmark: 2.9

- **CO2 / capita**
  - Score: 2.1
  - Gap from Benchmark: 3.9

- **CO2 / capita**
  - 50% of benchmark: 6
Exploring Results

Index Category Change

- 6 out of 7 index categories have rising scores, 2010-2015
- Only Environment & Land Use category has score decrease
  *Driven by air quality and solid waste problems*
- Economic category has fastest score growth

Most categories improved in Chinese cities, form 2010-2015
Chinese cities saw mixed indicator performance

Exploring Results

Index Indicator Change

- 11 out of 19 index indicators have rising scores, 2010-2015
  
  *Highest increase of 121% in five years (Urban Rail Extent)*

- 8 out of 19 index indicators have score decrease, 2010-2015
  
  *Biggest drop in score is -21% (Blue Sky Days, AQI)*
Exploring Results
City Group Scores

Larger, Wealthier, Developed cities have better, higher scores in the LOGIC Index.
### Exploring Results

#### Top Scoring Cities

Cities of all types can be Top-Performers in the LOGIC Index.

<table>
<thead>
<tr>
<th>City Name</th>
<th>Rank, Overall Index</th>
<th>Overall Score</th>
<th>Economic Group</th>
<th>Size Group</th>
<th>Region</th>
<th>Low Carbon Pilot Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shenzhen</td>
<td>1</td>
<td>69.7</td>
<td>Group P</td>
<td>Mega</td>
<td>East</td>
<td>Pilot</td>
</tr>
<tr>
<td>Xiamen</td>
<td>2</td>
<td>66.0</td>
<td>Group P</td>
<td>Large</td>
<td>East</td>
<td>Pilot</td>
</tr>
<tr>
<td>Changde</td>
<td>3</td>
<td>58.5</td>
<td>Group I</td>
<td>Large</td>
<td>Central</td>
<td>Non-Pilot</td>
</tr>
<tr>
<td>Nanning</td>
<td>4</td>
<td>58.2</td>
<td>Group I</td>
<td>Large</td>
<td>West</td>
<td>Non-Pilot</td>
</tr>
<tr>
<td>Haikou</td>
<td>5</td>
<td>57.7</td>
<td>Group T</td>
<td>Large</td>
<td>East</td>
<td>Pilot</td>
</tr>
<tr>
<td>Ganzhou</td>
<td>6</td>
<td>57.5</td>
<td>Group I</td>
<td>Large</td>
<td>Central</td>
<td>Pilot</td>
</tr>
<tr>
<td>Guangzhou</td>
<td>7</td>
<td>57.5</td>
<td>Group P</td>
<td>Mega</td>
<td>East</td>
<td>Pilot</td>
</tr>
<tr>
<td>Shantou</td>
<td>8</td>
<td>57.4</td>
<td>Group T</td>
<td>Large</td>
<td>East</td>
<td>Pilot</td>
</tr>
<tr>
<td>Jieyang</td>
<td>9</td>
<td>56.7</td>
<td>Group I</td>
<td>Large</td>
<td>East</td>
<td>Pilot</td>
</tr>
<tr>
<td>Gulin</td>
<td>10</td>
<td>56.3</td>
<td>Group I</td>
<td>Large</td>
<td>West</td>
<td>Pilot</td>
</tr>
<tr>
<td>Zhanjiang</td>
<td>11</td>
<td>55.8</td>
<td>Group I</td>
<td>Large</td>
<td>East</td>
<td>Pilot</td>
</tr>
<tr>
<td>Beijing</td>
<td>12</td>
<td>55.5</td>
<td>Group P</td>
<td>Mega</td>
<td>East</td>
<td>Pilot</td>
</tr>
<tr>
<td>Hangzhou</td>
<td>13</td>
<td>55.3</td>
<td>Group P</td>
<td>Very Large</td>
<td>East</td>
<td>Pilot</td>
</tr>
<tr>
<td>Nanjiang</td>
<td>14</td>
<td>54.8</td>
<td>Group T</td>
<td>Large</td>
<td>Central</td>
<td>Pilot</td>
</tr>
<tr>
<td>Wenzhou</td>
<td>15</td>
<td>54.8</td>
<td>Group T</td>
<td>Very Large</td>
<td>East</td>
<td>Pilot</td>
</tr>
<tr>
<td>Guangyuan</td>
<td>16</td>
<td>54.7</td>
<td>Group I</td>
<td>Large</td>
<td>West</td>
<td>Pilot</td>
</tr>
<tr>
<td>Jiangmen</td>
<td>17</td>
<td>54.5</td>
<td>Group I</td>
<td>Large</td>
<td>East</td>
<td>Pilot</td>
</tr>
<tr>
<td>Kunming</td>
<td>18</td>
<td>54.5</td>
<td>Group T</td>
<td>Large</td>
<td>West</td>
<td>Pilot</td>
</tr>
<tr>
<td>Chengdu</td>
<td>19</td>
<td>53.7</td>
<td>Group T</td>
<td>Mega</td>
<td>West</td>
<td>Non-Pilot</td>
</tr>
<tr>
<td>Yangzhou</td>
<td>20</td>
<td>53.6</td>
<td>Group T</td>
<td>Large</td>
<td>East</td>
<td>Non-Pilot</td>
</tr>
</tbody>
</table>
Key Findings

• Chinese Cities have considerable room to improve
  *Especially in the economic, transportation, & industry dimensions*

• Economic, Energy, + Industry categories drive index scores
  *Urban energy and economic structure are key part of low-carbon transition*

• Cities of all types can be Top-Performers in the LOGIC Index
  *Cities with different levels of economic & urban development achieved high scores; all cities can learn from top-performers in any Group, any Region, & any Policy area*
Conclusions

The LOGIC Index allows deep and detailed exploration of city performance:

• The LOGIC Index is useful to compare China’s cities to global benchmarks, on multiple green + low-carbon dimensions.

• The index helps in identifying promising opportunities, and in understanding key challenge areas.

• National and Local governments can use LOGIC Index scores to prioritize policies and financial support; and to promote city exchanges and learning.
LOGIC Tool: [http://logic.igdp.cn/](http://logic.igdp.cn/)

China LOGIC Index

Low-Carbon & Green Index for Cities (LOGIC)

"LOGIC" is a new city index system and analytical tool designed to measure and inform China’s progress on improved solutions for low carbon and clean energy development, and early carbon peaking.

Use this website to see 2017 LOGIC Results and to Explore LOGIC Data.
End
Thank You

Thursday, July 19 2018
6th Floor
LEED for Cities: A globally consistent urban performance measurement tool
Roger Platt
Leadership by cities is crucial in order to chart a more sustainable path for the people of this planet.
LEED for Cities
GREEN BUILDINGS FOR EVERYONE WITHIN THIS GENERATION
167 COUNTRIES & TERRITORIES
92,000+ TOTAL PROJECTS
BEYOND BUILDINGS.
LEED + PERFORMANCE
• City provides data across 5 categories to generate score:
  
  - Energy
  - Water
  - Waste
  - Transportation
  - Human Experience
<table>
<thead>
<tr>
<th>Category</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>1. Greenhouse Gas Emissions (CO\textsubscript{2} equivalent)</td>
</tr>
<tr>
<td></td>
<td>2. Water Consumption</td>
</tr>
<tr>
<td>Waste</td>
<td>3. Municipal Solid Waste Generated</td>
</tr>
<tr>
<td></td>
<td>4. Municipal Solid Waste Diverted from Landfill</td>
</tr>
<tr>
<td>Transportation</td>
<td>5. Distance Traveled in Individual Vehicles Daily</td>
</tr>
<tr>
<td>Education</td>
<td>6. Population with (at least) a High School Degree</td>
</tr>
<tr>
<td></td>
<td>7. Population with (at least) a Bachelor's Degree</td>
</tr>
<tr>
<td>Equitability</td>
<td>8. Median Gross Rent as % of Household Income</td>
</tr>
<tr>
<td></td>
<td>9. Income Differential/Gini coefficient</td>
</tr>
<tr>
<td>Prosperity</td>
<td>10. Median Household Income</td>
</tr>
<tr>
<td></td>
<td>11. Unemployment rate</td>
</tr>
<tr>
<td>Health &amp; Safety</td>
<td>12. Median Air Quality Index (AQI)</td>
</tr>
<tr>
<td></td>
<td>13. Air Quality Days Unhealthy for Sensitive Groups</td>
</tr>
<tr>
<td></td>
<td>14. Violent Crime</td>
</tr>
</tbody>
</table>
Parameters Available for Further Performance Tracking

• 200+ Parameters preloaded on the platform

• Additionally, Cities can provide parameters for measuring customized priorities
Improve performance and certify to LEED for Cities:

Step 1: Register your city in arc
Step 2: Pre-certify
Step 3: Share data to receive a score
Step 4: GBCI review of data
Step 5: Certify to LEED for Cities
SCALABILITY & CUSTOMIZATION:

- LEED for Cities can be used at multiple scales
- A city can focus efforts on an area in a city or use it city-wide
- A city can start small & ramp up to make progress towards their goals
- The program offers 100s of parameters to track performance & address a city’s customized conditions
Multiple Points of Engagement - Atlanta

Atlanta International Airport
35 projects (5 Certified, 7 Registered, 35 on Arc)
LEED Campus
LEED for Communities - PreCertified

City of Atlanta
1062 LEED projects
LEED for Cities – Registered and BoA Grantee
Certified 3-STAR Community (2014)
- Working on Recertification
COLLABORATION:

- Cities can leverage the program to collaborate with global initiatives.
- Cities can enhance already existing engagement by leveraging important partners, tools, & programs.
- By combining complimentary info & strategies from these programs, cities can develop & refine policies, generate broad private investments, increase citizen engagement & influence behavioral change in society.
Competitive Washington DC
Hey Alexa - what's the best location for @Amazon's second headquarters?

Obviously, Washington, DC.

#ObviouslyDC

The best city for Amazon HQ2? Washington, DC
Resiliency in Boston
Circular Economy in San Jose
U.S. Green Building Council Announces LEED for Cities Grant Program with Support from Bank of America Charitable Foundation

Published on 28 Feb 2018
Written by Marisa Long
Posted in Media

WASHINGTON, D.C.—(Feb. 28, 2018)—Today, USGBC creators of the LEED green building rating system, with support from the Bank of America Charitable Foundation, announced a new grant program designed to recognize the sustainability and green building achievements of U.S. cities pursuing LEED for Cities certification.

Initial grant recipients include San Jose, California; Denver, Colorado; Phoenix, Arizona; Atlanta, Georgia; Washington, D.C.; and Chicago, Illinois. Each grant will consist of financial assistance to aid in the pursuit of LEED for Cities certification, educational resources and customized technical support.
LEED for Cities Adding Value | Triple Bottom Line

USGBC Strategic Focus:
- Expand the green building marketplace
- Expand sustainable, healthy and resilient communities, cities and cultures
- Calibrate and communicate the full benefit of green building, communities, cities and cultures
- Ensure viability through organizational and community excellence
LEED for Cities: A vision worth fighting for
ALL CITIES IN

Thursday, July 19 2018
6th Floor
HOW WASTE MANAGEMENT CAN PUT CHINESE CITIES ON THE ROAD TO A LOW CARBON FUTURE

Brian Guzzone
Eastern Research Group
Who we are and what we do...

• Over 30 years in environmental consulting

• Employee-owned

• Major clients: EPA, OSHA, CDC, NOAA, DoD, FDA; state and local government

Helping our clients protect the environment, improve worker health and safety, ensure the safety of food and drugs, plan sustainable facilities, and achieve other positive outcomes.
What am I going to talk about…

• The role of methane in waste management
• Waste management 101
• Ways to reduce or avoid methane from waste
• China’s waste conundrum
• Overcoming challenges and benefits of improved waste practices in Chinese cities
• Profiles of successful waste projects in China
• Profiles of waste projects in the US
Methane…more bang for the Yuan!

- Most prevalent manmade greenhouse gas after CO₂
- Traps 28 times more heat in the atmosphere than CO₂ *
- Accounts for 32% of climate forcing
- Short-lived climate pollutant, with atmospheric lifespan of 12 years

* Intergovernmental Panel on Climate Change (IPCC), Climate Change 2013: The Physical Science Basis-Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change
China: toward a circular economy

Source: Ellen MacArthur Foundation
How we (should) manage our waste...

Waste Management Hierarchy

- Source Reduction & Reuse
- Recycling/Composting
- Energy Recovery
- Treatment & Disposal

[Images of waste management equipment and facilities]
Reducing methane yields many benefits

**Mitigating Emissions from the Waste Sector Results in Numerous Benefits for the Community**

**Challenges**
- Black carbon emissions from vehicles and equipment
- Black carbon emissions from open burning and landfill and dump fires
- Methane emissions from landfills and dumps

**Solutions**
- Efficient waste collection, transport, and handling
- Preventing waste burning
- Organic waste management
- Landfill gas capture

**Benefits**

**ENVIRONMENTAL**
- Climate change mitigation
- Air quality protection
- Water quality protection
- Litter reduction

**SOCIAL**
- Improved public health
- Worker protection
- Improved welfare of the informal sector
- Improved aesthetics

**ECONOMIC**
- Job creation
- Resource conservation
- Costs reduction
- Energy generation
Ways of reducing methane from waste
China’s waste conundrum

- Generated ~200 MMT of MSW (‘05), roughly 25% of the world’s MSW
- World Bank estimates MSW generation to exceed 500 MMT annually by 2025
- While collection has improved in most cities, recycling rates (~4%) and composting (~2%) have declined
- Most waste is sent to landfill or incineration (larger cities)
- Waste contributed 113 MMTCO$_2$e (total non-CO$_2$ GHG emissions over 2,000 MMTCO$_2$e [2012]). EPA estimates methane emissions from landfills alone will increase to about 50 MMTCO$_2$e by 2030 (U.S. EPA, 2012)
Overcoming challenges to China’s waste practices

• Lacking national and local policies
• Competition with landfilling and cheap chemical fertilizer
• Limited administrative and technical capacity
• Inadequate infrastructure, markets and supply chain
• Insufficient educational initiatives
Benefits to Chinese cities from improved waste practices

• Source reduction best practices reduces food waste from farms and the food supply chain

• Distribution of uneaten food can help people in need

• Anaerobic digestion of food waste provides nutrient-rich byproducts and biogas can be used to generate electricity or heat or renewable natural gas

• Diversion of food wastes from landfills can extend the life of landfills and contribute to land preservation (important in China)

• Significant positive impact on local economies
What China’s doing (right) about waste

**CANFIT, BEIJING**

- Biogas upgraded to biomethane
- Biofuel (from restaurant FOG)
- Digestate
  - Biochar
  - Compost
- Ethanol (experimental)
- Bio detergents from fruits and vegetables
- Food waste-to-maggots
What China’s doing (right) about waste

NINGBO ISWM SYSTEM

- Located near Shanghai
- ~7.85 million inhabitants
- Produces about 3.2 million tons of MSW annually
- Primarily depended on landfill disposal and some WTE
- Shifting to sustainable integrated approach
What China’s doing (right) about waste

NINGBO’S ISWM SYSTEM

- 1\textsuperscript{st}/largest residential SSO project in China
- 1 new digester operational and 2 more food/kitchen waste digesters under construction
- Conducting surveys, local government engagement, developing public education campaigns
UPGRADED BIOGAS FROM ORGANICS
FUELS TRUCK FLEET AND PIPELINE
INJECTION

- 230 tons/day high solids yard and food waste
- Generating and recovering biogas
- Producing CNG for ~75 CR&R vehicles
- Digestate used to produce co-products
- 1st organics project in CA to pipeline inject RNG
- Project continues to expand (4 phases)
- By ~2020, project will generate 4 million gallons of RNG and 260,000 tons of fertilizer
ST. LANDRY PARISH
LANDFILL, LA

SMALL-SCALE LFG RNG

- **1ST BIOGAS TO VEHICLE FUEL PROJECT IN LOUISIANA**

- 2012: CONVERTED SMALL AMOUNT OF LANDFILL GAS INTO VEHICLE FUEL

- 2015: OVER 600 GGE/DAY FROM LFG

- FUELING 10-12 COLLECTION TRUCKS

- TRANSPORTING RNG OFF SITE TO FUELING STATION (1ST IN THE US)
CO-DIGESTION OF BIOSOLIDS/FOOD WASTE GENERATES 20MW ELECTRICITY FOR ONSITE USE

- One of the largest WWTPs in the world
- Processes ~280 million gallons of wastewater/day
- Sludge is digested to produce biogas
- Biogas fuels gas turbines with exhaust heat recovery / steam generation
- Up to 20,000 gal/d food waste slurry added to boost biogas production
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