

COPENHAGEN CLEANTECH CLUSTER
Global Cleantech Report 2012

A SNAPSHOT OF FUTURE GLOBAL MARKETS

- EXECUTIVE PRESENTATION -

May, 2012

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Table of contents

1) Executive Summary

The cleantech platforms and global markets: a sector in growth

- The cleantech sector will continue to grow towards 2015 with green buildings, smart grid and offshore wind as the fastest-growing platforms *p. 3*
- The “centre of gravity” for cleantech growth is moving East and West *p. 4*
- The megacities are the main growth engines as ECO-city ambitions and principles seem to be "the new normal" *p. 5*
- The world's urbanisation rate will continue to be rapid, and large investments will be made in developing megacities and suburb areas *p. 6*
- The six megacity cleantech clusters – including the four American Hotspots and the two Great Turks – will account for the majority of the cleantech growth *p. 7*

The global cleantech challenge: a complex value system

- To unleash the full global potential, the cleantech sector must cross the cost of energy chasm and accelerate the industrialisation *p. 9*
- Complex value-creation models need to be investigated and developed in order to meet the demand for competitive integrated solutions with local content *p. 10*
- The traditional Go-to-Market approaches will not be suitable when addressing this new market as demand is moving towards complex value systems *p. 11*
- Large Public-Private Partnerships (PPP) will be a cornerstone to overcome shortage in capital and competences in the "greening" of megacities *p. 12*
- The global majors will presumably lead the industrialisation and set the standards for future partnering regimes *p. 13*

The cleantech sector in a Danish context: an opportunity or a threat?

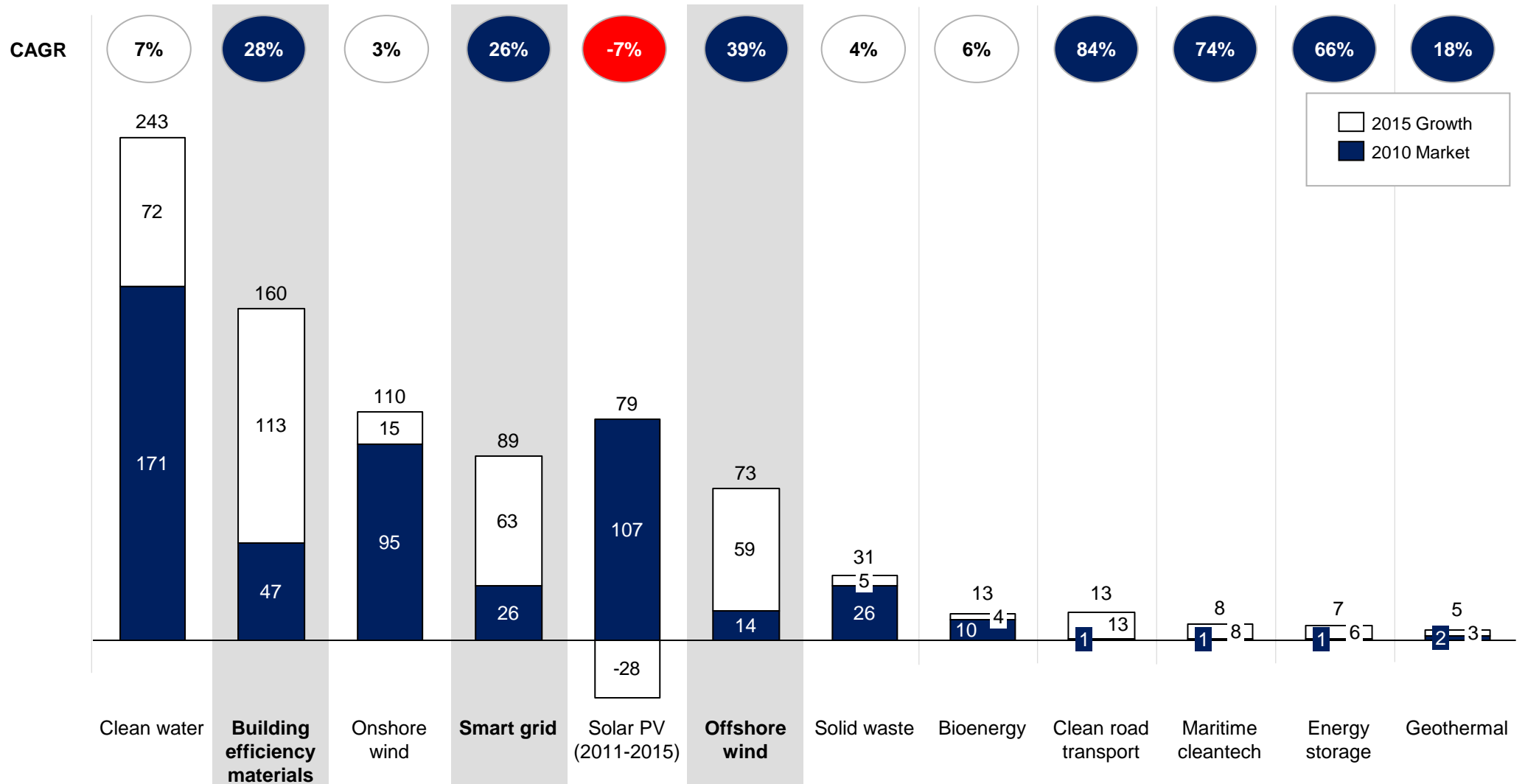
- Today, Danish companies are well-positioned to capture value in the attractive parts of the cleantech sector *p. 15*
- Neglecting the change agenda can be lethal to both small and big companies in the Danish cleantech sector *p. 16*
- In the near future, new and more decisive intervention strategies must be developed to win the battle of the cleantech sector *p. 17*

2) Appendix

p. 18

The cleantech sector will continue to grow towards 2015 with green buildings, smart grid and offshore wind as the fastest-growing platforms

Cleantech platforms – market size (USD billions)

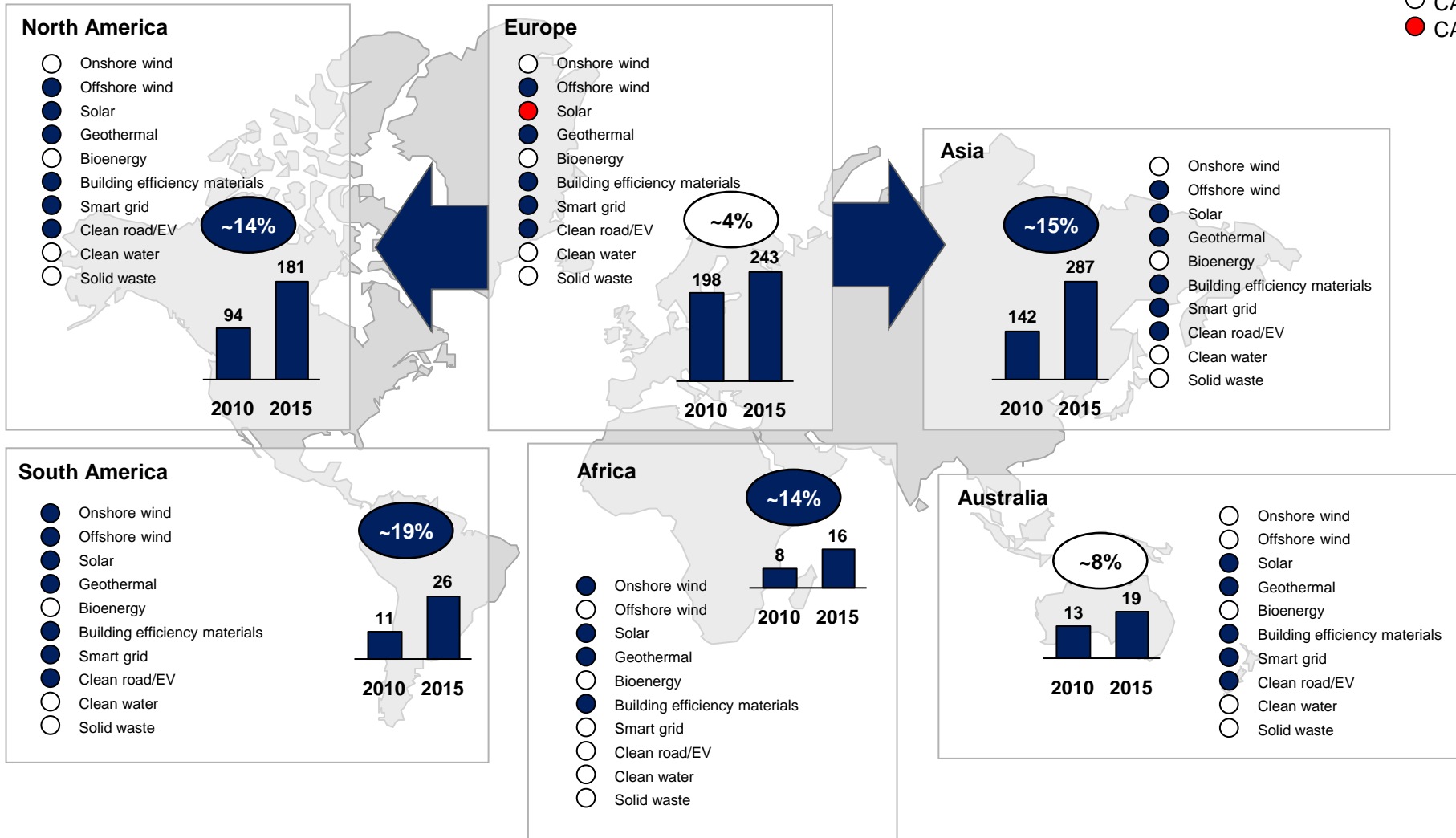


Note: Markets include all major CAPEX but not operations or commodities. Total may vary due to roundings

The “centre of gravity” for cleantech growth is moving East and West

The global market for cleantech across regions, 2010- 2015E (USD billions)

- CAGR >10%
- CAGR 0-10%
- CAGR < 0%

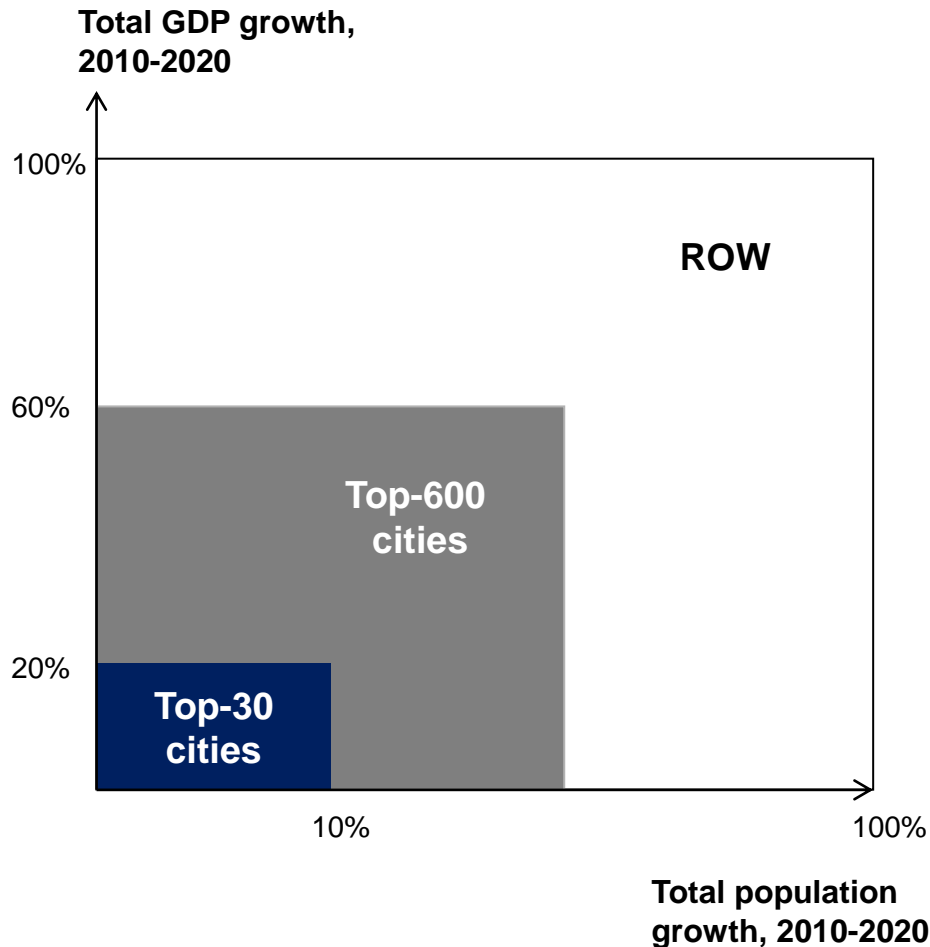


Note: “centre of gravity” is used as a metaphorical term in this context

The megacities are the main growth engines as ECO-city ambitions and principles seem to be "the new normal"

Top-30 cities will drive 20% of the GDP growth from 2010-20

Cities have the power to influence cleantech investments through large projects



Area	City power	Number of city projects
Transport	●	◐
Buildings	◐	◐
Waste	●	●
Water	◐	◐
Energy supply	◐	◐
Outdoor lighting	●	◐

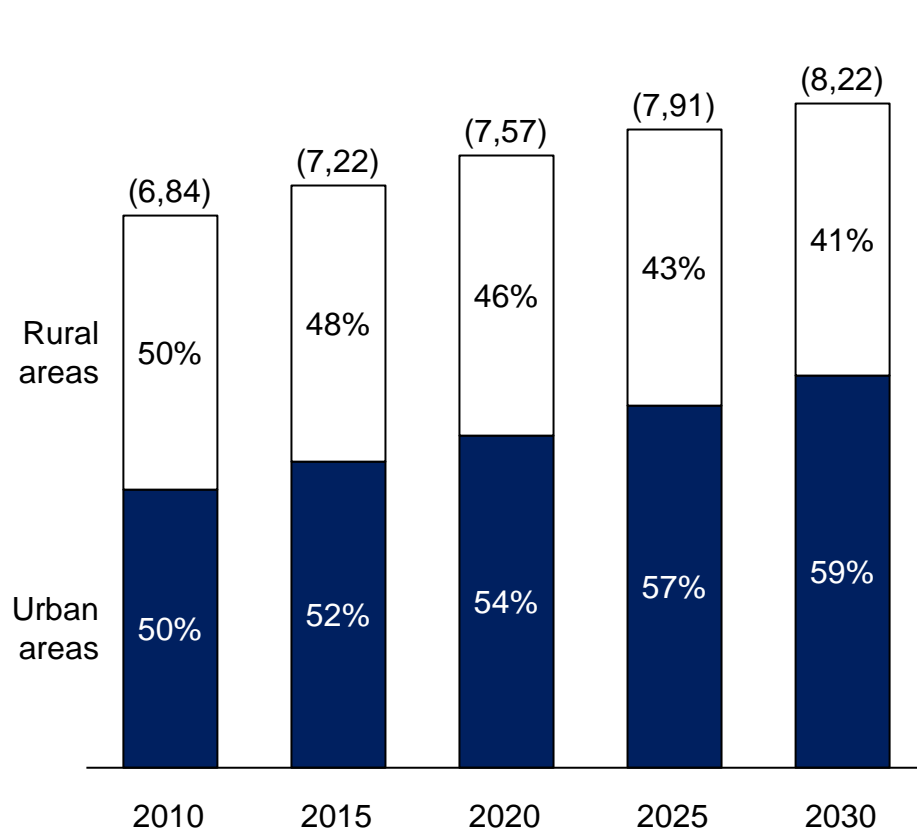
ECO-city definition

ECO-cities cover five focus areas which contribute to improve the quality of life in cities while using resources in a sustainable way and reducing environmental impact

- Urban transport
- Waste
- Renewable and smart energy generation and distribution
- Water
- Building energy efficiency

The world's urbanisation rate will continue to be rapid, and large investments will be made in developing megacities and suburb areas

Share of the world's population living in urban areas
Per cent (billion people)



Example of Chinese investments in megacity developments



China is planning to invest DKK 1.800 billion across 160 infrastructure projects over the next couple of years to merge nine cities in South China, creating a city with 42 million inhabitants*

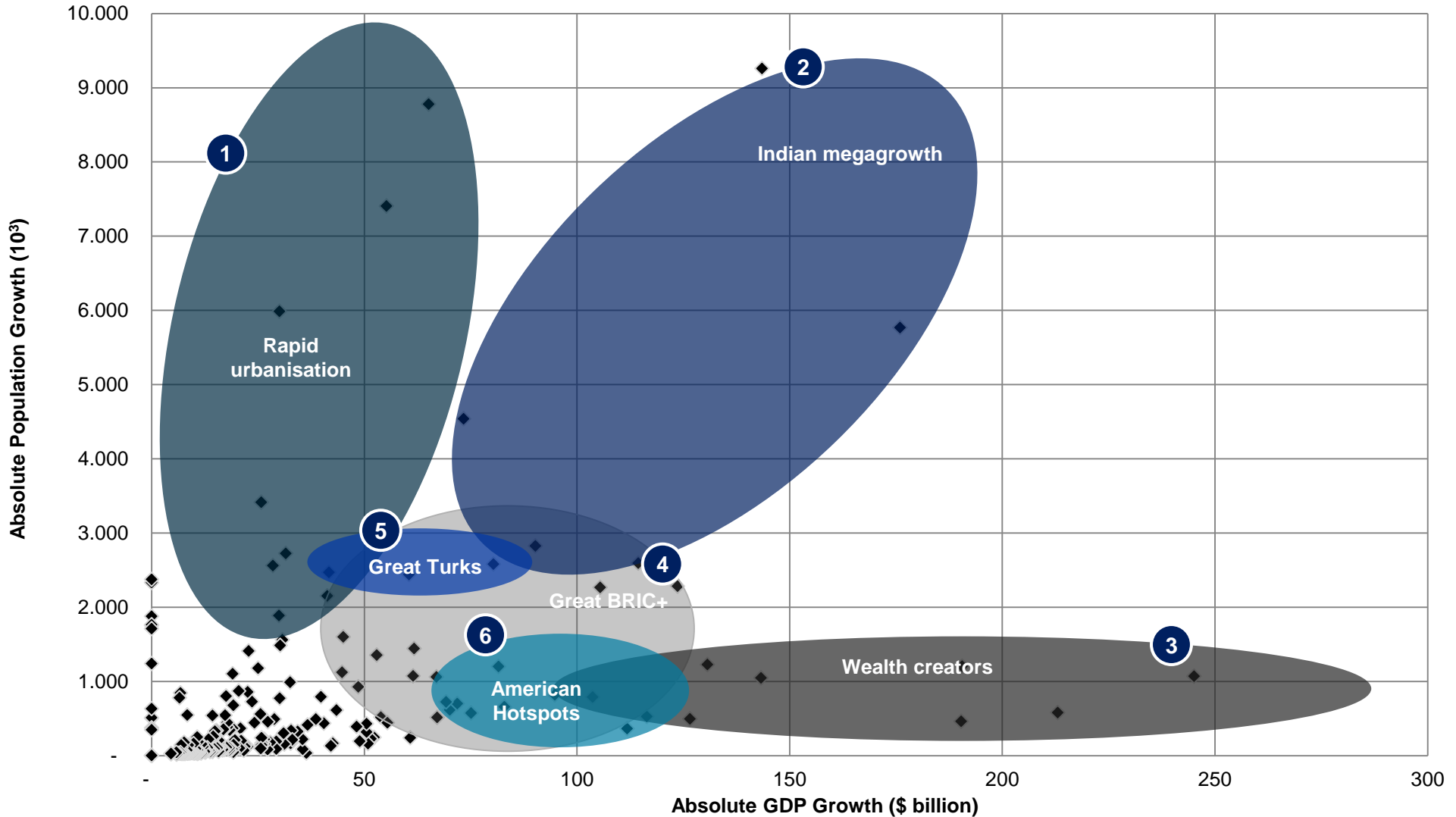
Total investment in urban infrastructure in China over the next five years is expected to hit GBP 685 billion, with an additional GBP 300 billion spend on high-speed rail and GBP 70 billion on urban transport

British Chamber of Commerce

7 | *The Telegraph, 24 Jan 2011, by Malcolm Moore in Shanghai and Peter Foster in Beijing
Source: World Economic Forum; The Economist; British Chamber of Commerce

The six megacity cleantech clusters – including the four American Hotspots and the two Great Turks – will account for the majority of the cleantech growth

Top-200 large cities' growth trajectories, 2012-2020



Note: The majority of these cities have set Eco city targets for e.g. emissions and have Eco city projects under way

Table of contents

1) Executive summary

The cleantech platforms and global markets: a sector in growth

- The cleantech sector will continue to grow towards 2015 with green buildings, smart grid and offshore wind as the fastest-growing platforms **p. 3**
- The “centre of gravity” for cleantech growth is moving East and West **p. 4**
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- The six megacity cleantech clusters – including the four American Hotspots and the two Great Turks – will account for the majority of the cleantech growth **p. 7**

The global cleantech challenge: a complex value system

- To unleash the full global potential, the cleantech sector must cross the cost of energy chasm and accelerate the industrialisation **p. 9**
- Complex value-creation models need to be investigated and developed in order to meet the demand for competitive integrated solutions with local content **p. 10**
- The traditional Go-to-Market approaches will not be suitable when addressing this new market as demand is moving towards complex value systems **p. 11**
- Large Public-Private Partnerships (PPP) will be a cornerstone to overcome shortage in capital and competences in the "greening" of megacities **p. 12**
- The global majors will presumably lead the industrialisation and set the standards for future partnering regimes **p. 13**

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- Neglecting the change agenda can be lethal to both small and big companies in the Danish cleantech sector **p. 16**
- In the near future, new and more decisive intervention strategies must be developed to win the battle of the cleantech sector **p. 17**

2) Appendix

p. 18

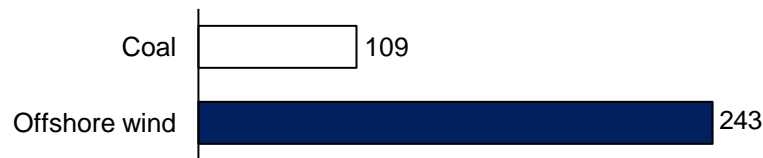
To unleash the full global potential, the cleantech sector must cross the cost of energy chasm and accelerate the industrialisation

In order to become a viable global industry, **cleantech must reduce cost of energy** to become independent of governmental support

So far, **no cleantech or clean energy industry has managed to cross the cost of energy chasm** without legislative support through incentives or codes

Coal vs. wind – global average costs* (USD/MWh)

EXAMPLES

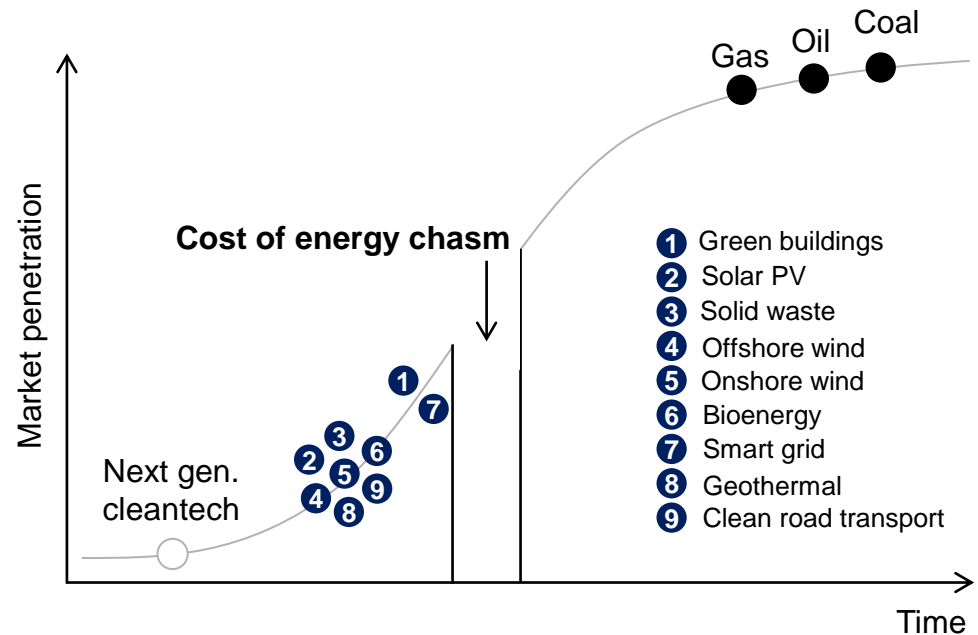


"Non-green" vs. green building – extra up-front cost for green building**



Sample technology maturity curve

ILLUSTRATIVE



In 2035, subsidies to renewables reach almost USD 250 billion in the New Policies Scenario. Onshore wind becomes competitive around 2020 in the European Union ... All other technologies require continuing subsidies

World Energy Outlook 2011

... smart grid and building energy efficiency equipment and services are the most probable ones crossing the cost of energy chasm since they are able to reduce alternative investments in infrastructure while reducing the operating cost

The Global Cleantech Report 2012

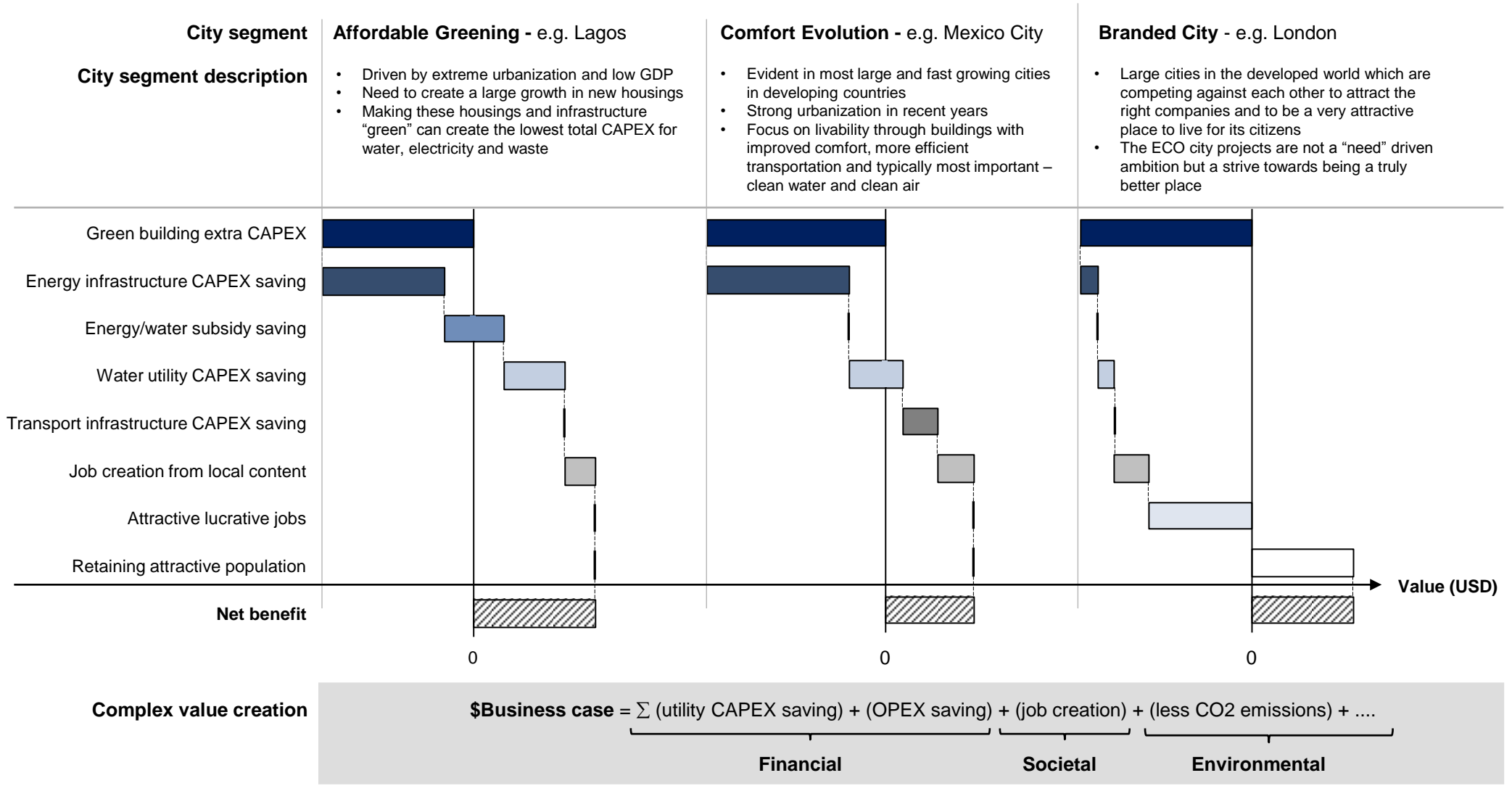
* Estimated for plants entering into service in 2016. Unit is 2012 USD

** The extra cost varies between countries due to difference in local build culture, certification programmes and green build material production

Complex value-creation models need to be investigated and developed in order to meet the demand for competitive integrated solutions with local content

ILLUSTRATIVE

Savings from integrated "One System" solutions across city segments



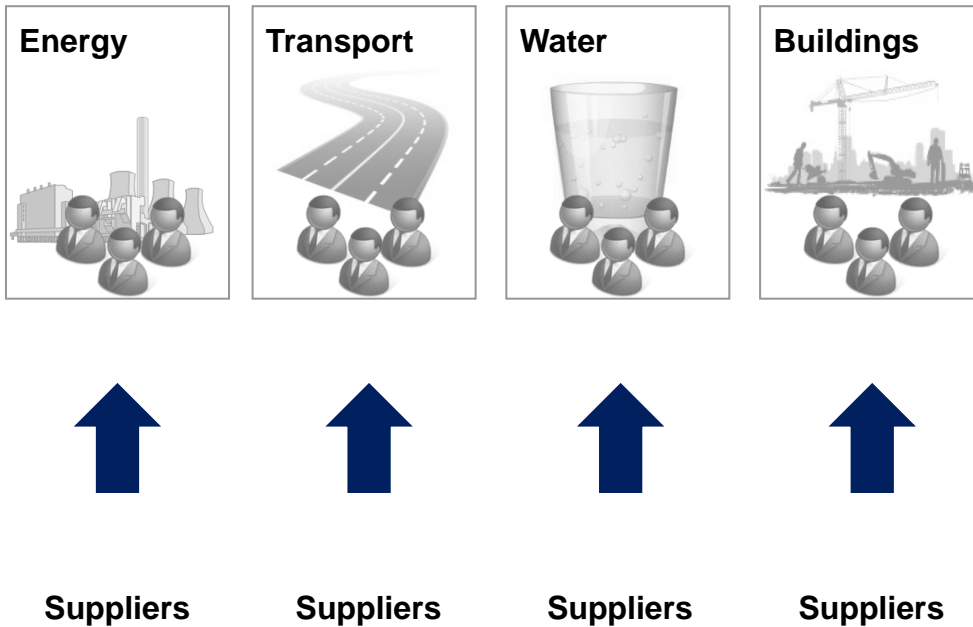
The traditional Go-to-Market approaches will not be suitable when addressing this new market as demand is moving towards complex value systems

From a micro-thinking approach with multiple customer touch-points across sectors ...

... to a macro approach where purchasing decisions are coordinated and made on an aggregated level across sectors

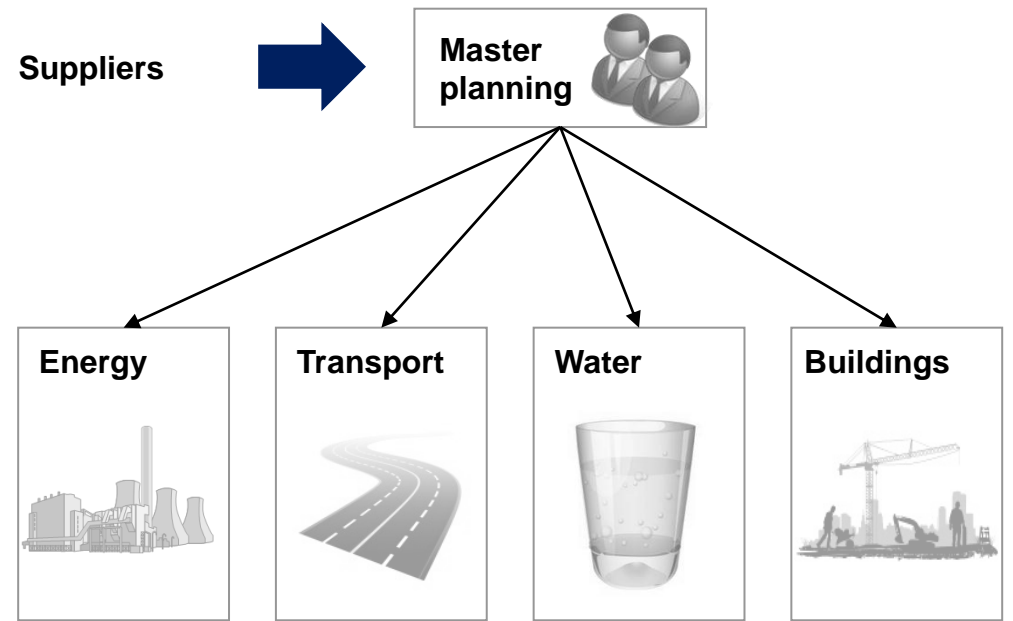
Traditional go-to-market approach

ILLUSTRATIVE



Market approach towards megacities

ILLUSTRATIVE



Large Public-Private Partnerships (PPP) will be a cornerstone to overcome shortage in capital and competences in the "greening" of megacities

Lack of capital

Cities are empowered to implement new sustainable projects but limited by access to capital

Competition for resources is fierce. Because of **growth pressures and capital constraints**, compromises are often reached to serve more interests rather than to serve more people more effectively

The World Bank – Ecological Cities as Economic Cities 2010

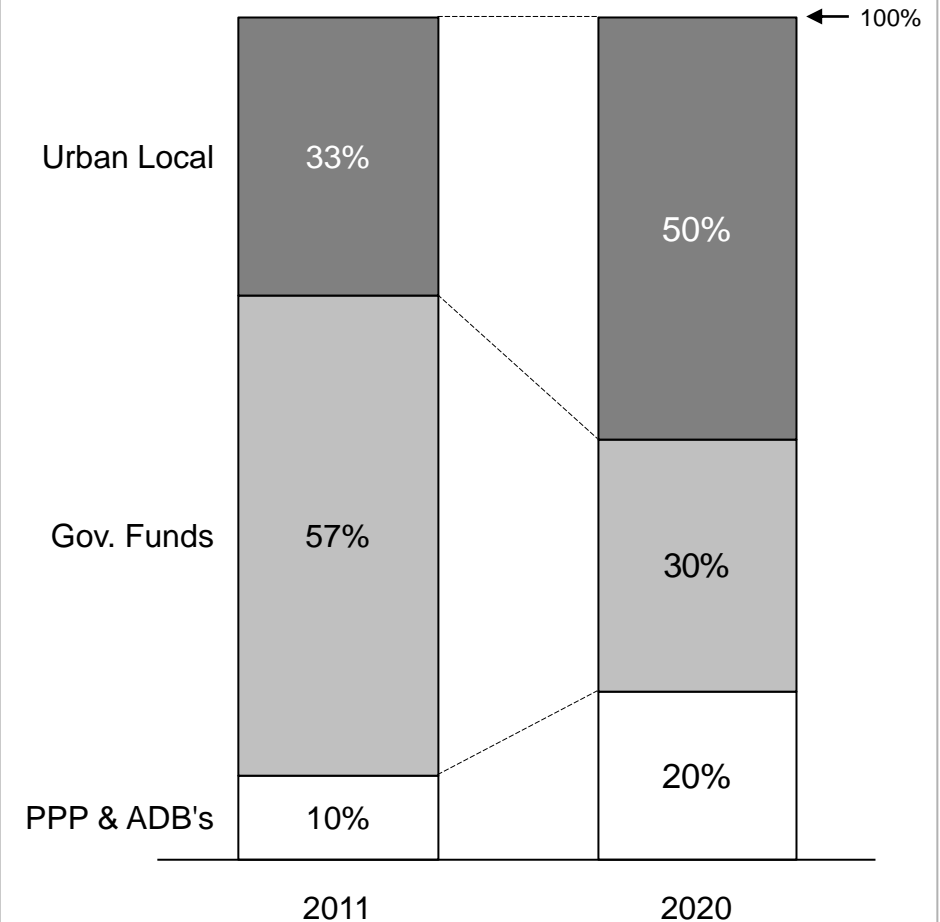
Lack of competences

Competences for sustainable planning and implementation are in shortage

Cities in developing countries face much tougher challenges than do their counterparts in developed countries. **Technical capacity is often lacking**

The World Bank – Ecological Cities as Economic Cities 2010





India case: Expected development in funding of regional projects in India



Note: PPP = Public-Private Partnerships, ADB = Asia Development Bank

The global majors will presumably lead the industrialisation and set the standards for future partnering regimes

Key Public-Private Partnerships (PPP) success cases

			
<p>Case 1: Veolia and Suez</p> <p>Global leaders in water, French Veolia Environnement (Vivendi) and Suez Environnement have partnered on PPP water projects and have pioneered the PPP model, injecting finance into the system and driving market growth and consolidation.</p> <p>In a PPP, ownership of assets remains public and only certain functions are delegated to a private company for a specific period.</p>	<p>Case 2: Toshiba</p> <p>The Japanese major global player Toshiba is driving some part of the Delhi Mumbai Corridor through large scale PPP projects funded by Japan Inc.</p> <p>Consortium of Japanese companies (Toshiba-Tokyo Gas-NEC) have signed a MoU* on a priority ECO-city project.</p>	<p>Case 3: Keppel Corp</p> <p>Tianjin Eco-city is sponsored by Keppel Corp from Singapore.</p> <p>The Keppel Group was entrusted to lead the Singapore private sector consortium for a bilateral co-operation project and works in close tandem with a Chinese consortium partner to guide the 50-50 joint venture – Sino-Singapore Tianjin Eco-City Investment and Development Co., Ltd. (SSTEC) – in its role as master developer of the Tianjin Eco-city.</p>	<p>Case 4: Siemens</p> <p>Siemens' new Infrastructure & Cities Sector will manage the company's global business with cities and infrastructures. The new Sector, with around 87.000 employees, will contain the Mobility and Building Technology Divisions from the Industry Sector, as well as the Power Distribution Division and Smart Grid business from the Energy Sector.</p>

* Memorandum of Understanding

Table of contents

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2) Appendix

p. 18

Today, Danish companies are well-positioned to capture value in the attractive parts of the cleantech sector

Cleantech industry	Competence level in DK	Global market size 2015	Sample companies	Global ranking within market*
Clean water			<ol style="list-style-type: none"> Grundfos Novozymes 7T 	<ol style="list-style-type: none"> Top 50 Top 100 Top 50
Green buildings			<ol style="list-style-type: none"> Rockwool VKR Grundfos Danfoss Kamstrup 	<ol style="list-style-type: none"> Top 5 Top 10 Top 10 Top 10 Top 50
Onshore wind			<ol style="list-style-type: none"> Vestas Siemens AH industries Hydratech 	<ol style="list-style-type: none"> Top 10 Top 10 Top 10 Top 10
Smart grid			<ol style="list-style-type: none"> DONG Energy EnergiNet 	<ol style="list-style-type: none"> Top 50 Top 50
Solar			<ol style="list-style-type: none"> Danfoss Power Electronics 	<ol style="list-style-type: none"> Top 50
Offshore wind			<ol style="list-style-type: none"> Vestas/Siemens DONG Energy A2Sea NKT Bladt 	<ol style="list-style-type: none"> Top 5 Top 5 Top 5 Top 10 Top 10
Solid waste			<ol style="list-style-type: none"> DONG Energy Kommune Kemi Hårslev Industries 	<ol style="list-style-type: none"> Top 50 Top 50 Top 10
Bioenergy			<ol style="list-style-type: none"> Babcock Novozymes DONG Energy 	<ol style="list-style-type: none"> Top 10 Top 10 Top 50
Clean road transport			<ol style="list-style-type: none"> Better Place Danfoss 	<ol style="list-style-type: none"> Top 10 Top 20
Maritime cleantech			<ol style="list-style-type: none"> Desmi Alfa Laval Aalborg AP Møller Maersk 	<ol style="list-style-type: none"> Top 10 Top 5 Top 5

* Indicative global rating in niche market, e.g. Rockwool in the insulation market or Grundfos in the water utility equipment market based on MEC Intelligence analysis

Neglecting the change agenda can be lethal to both small and big companies in the Danish cleantech sector

Strategic focus area	From to
<div style="background-color: #003366; color: white; padding: 10px; writing-mode: vertical-rl; transform: rotate(180deg);">Business strategy</div>	<div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 5px;">Markets</div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 5px;">Business models</div> <div style="border: 1px solid #ccc; padding: 5px;">Business cases</div>	<div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 5px;">BRIC market, Europe and North America</div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 5px;">Risk diversification and avoidance</div> <div style="border: 1px solid #ccc; padding: 5px;">Stand-alone (single bottom line)</div>
<div style="background-color: #003366; color: white; padding: 10px; writing-mode: vertical-rl; transform: rotate(180deg);">Value proposition</div>	<div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 5px;">Innovation</div> <div style="border: 1px solid #ccc; padding: 5px;">Products</div>	<div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 5px;">Walled garden</div> <div style="border: 1px solid #ccc; padding: 5px;">Engineering and "High end"</div>
<div style="background-color: #003366; color: white; padding: 10px; writing-mode: vertical-rl; transform: rotate(180deg);">Go to Market</div>	<div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 5px;">Partners</div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 5px;">Sales and marketing</div> <div style="border: 1px solid #ccc; padding: 5px;">Customer relations</div>	<div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 5px;">DIY</div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 5px;">"Push"</div> <div style="border: 1px solid #ccc; padding: 5px;">Industrial</div>

In the near future, new and more decisive intervention strategies must be developed to win the battle of the cleantech sector

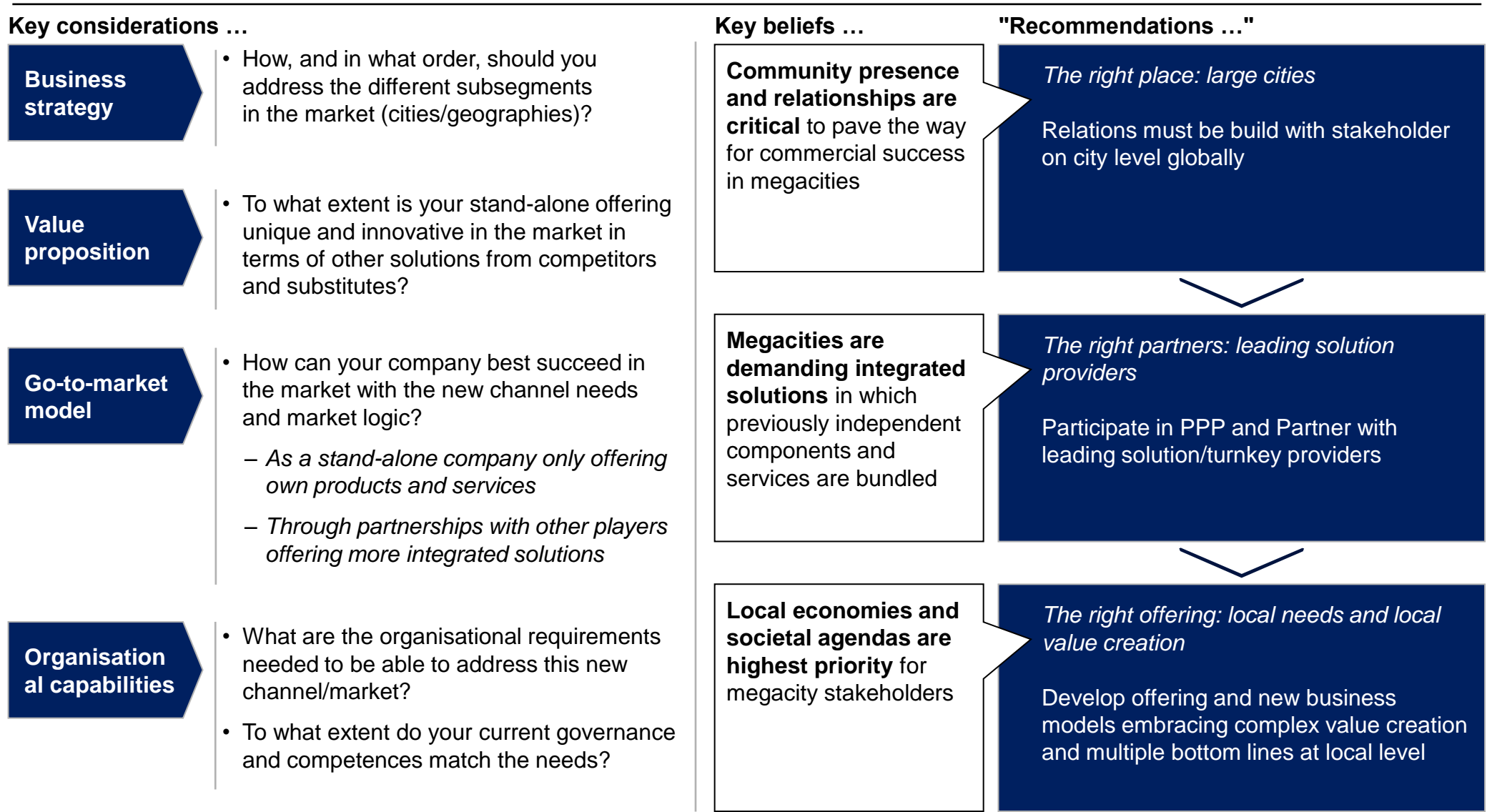


Table of contents

1) Executive summary

2) Appendix

Cleantech sectors

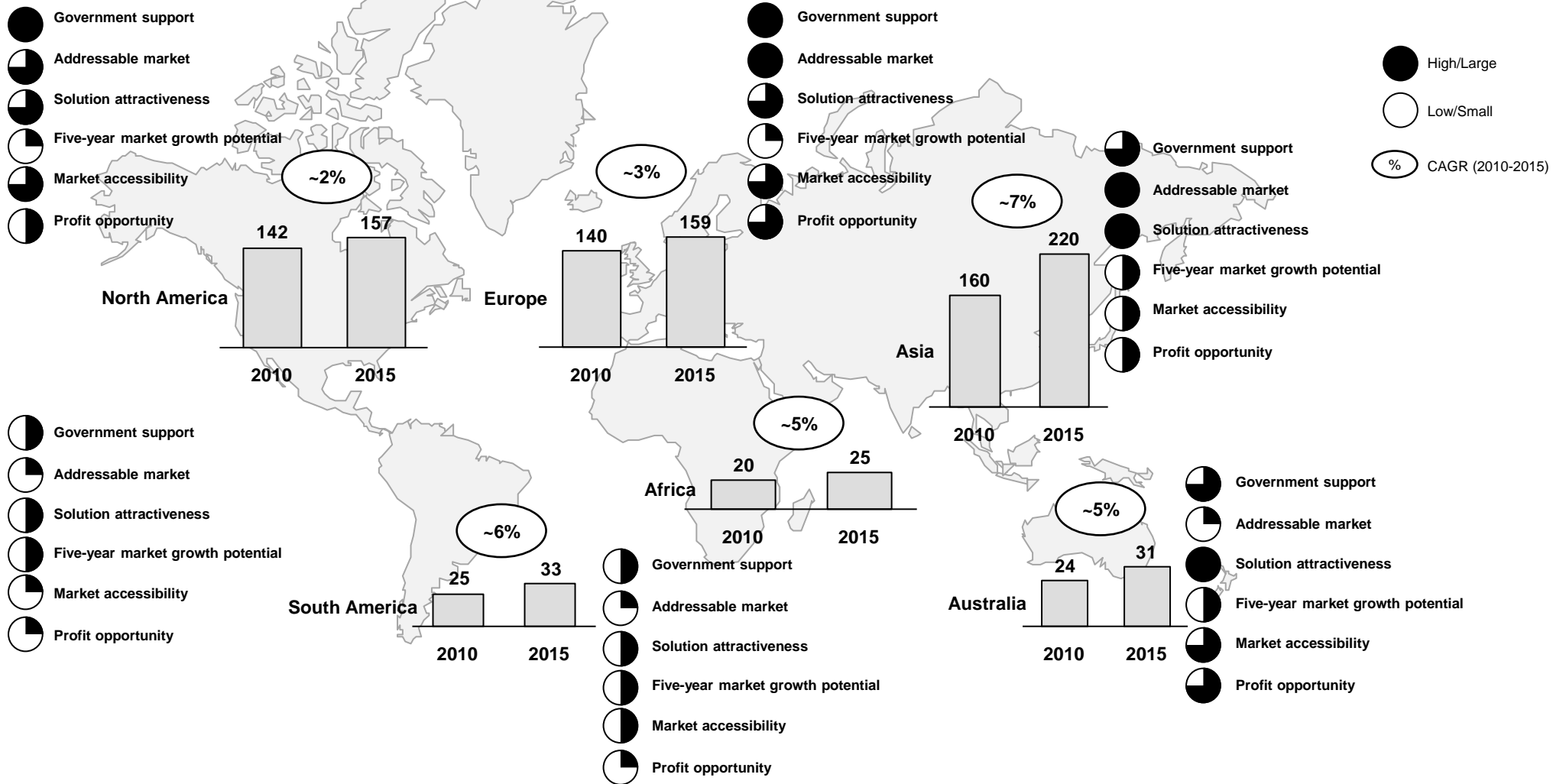
- Clean water *p. 19 + 20*
- Green buildings *p. 21*
- Onshore wind *p. 22*
- Smart grid *p. 23*
- Solar *p. 24*
- Offshore wind *p. 25*
- Solid waste *p. 26 + 27*
- Bioenergy *p. 28*
- Clean road transport *p. 29*
- Geothermal *p. 30*

The Megacity Clusters *p. 31*

As the largest and fastest-growing market globally, Asia dominates the **water market** as key developed markets mature

Clean water – CAPEX and OPEX made by Utilities, Municipalities and Industries – Global market across regions, 2010-2015E
(USD billions)

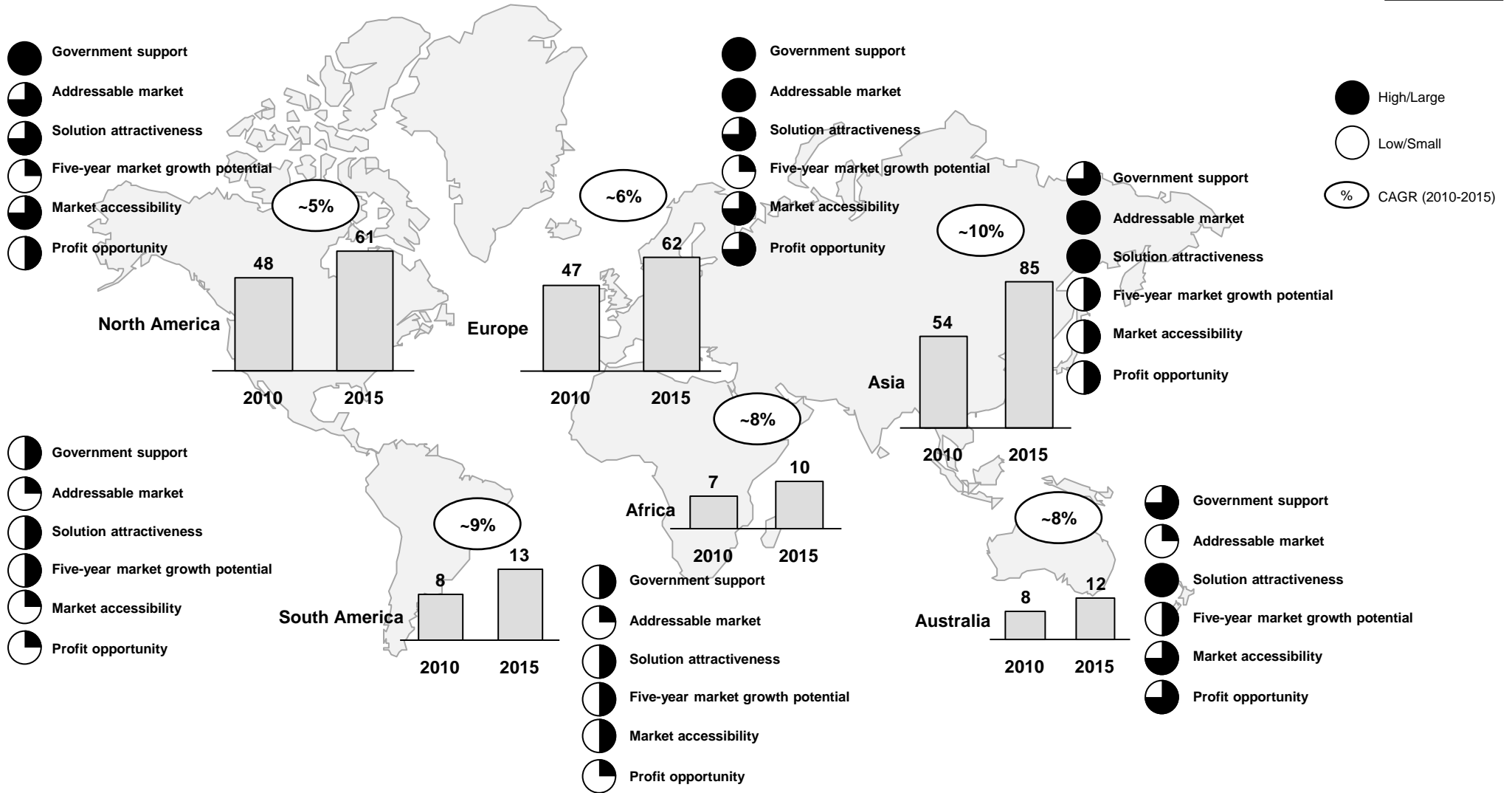
ESTIMATE



The capital expenditure in the **water sector** is expected to grow from USD ~170 billion in 2010 to USD ~245 billion in 2015 or nearly 30-35% of the total water market

Clean water – CAPEX Water and Waste Water Infrastructure – Global market across regions, 2010-2015E (USD billions)

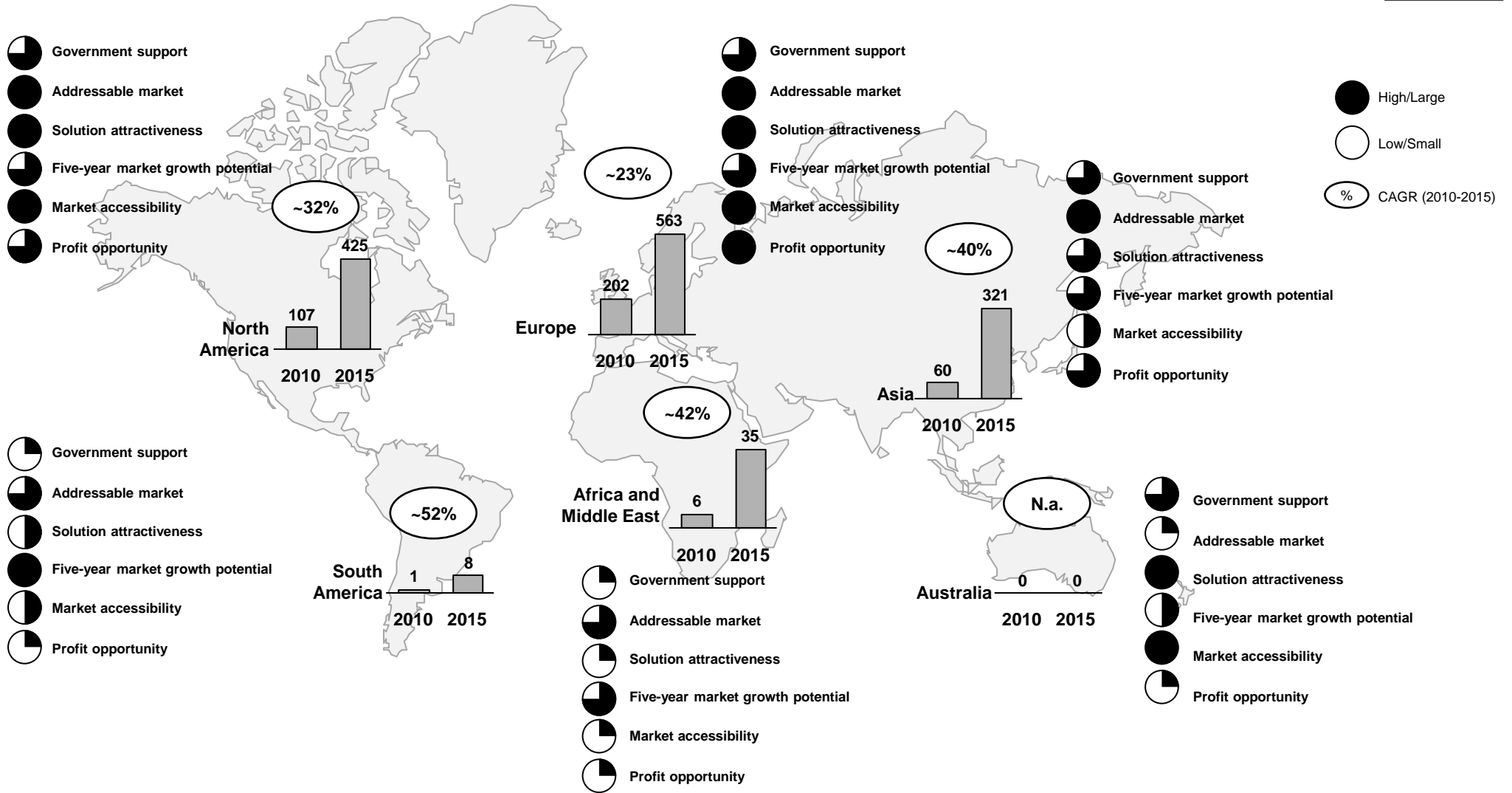
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Europe is projected to be the largest market for **green buildings** in 2015 followed by North America and Asia – Asia is expected to grow at almost double the rate of Europe

Green building materials – CAPEX Global market across regions, 2010-2015E (USD billions)

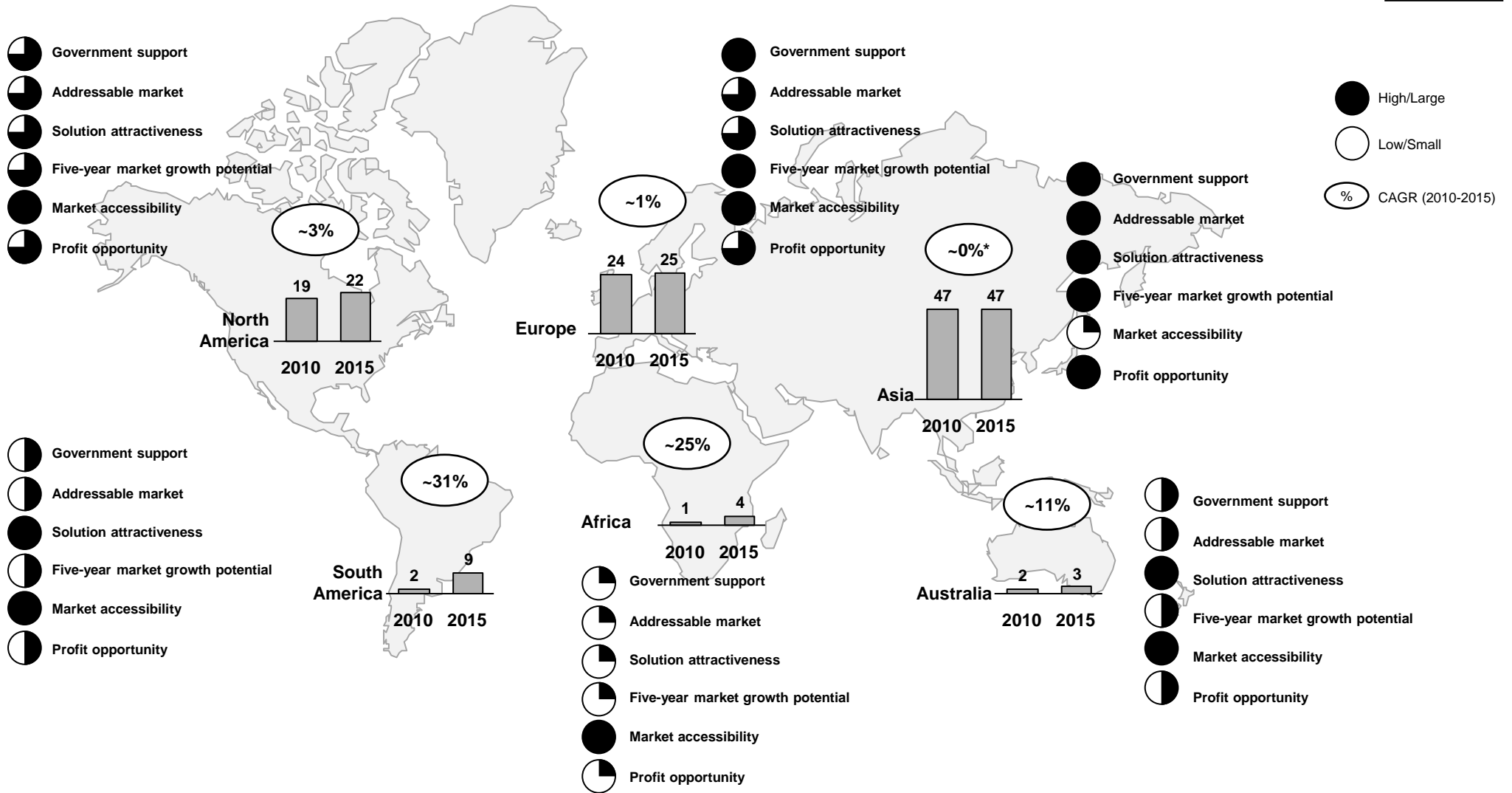
ESTIMATE



Value-wise, the key **onshore wind** markets are large and stagnant. Growth is coming from new regions

Onshore wind – CAPEX Global market across regions, 2010-2015E (USD billions)

ESTIMATE

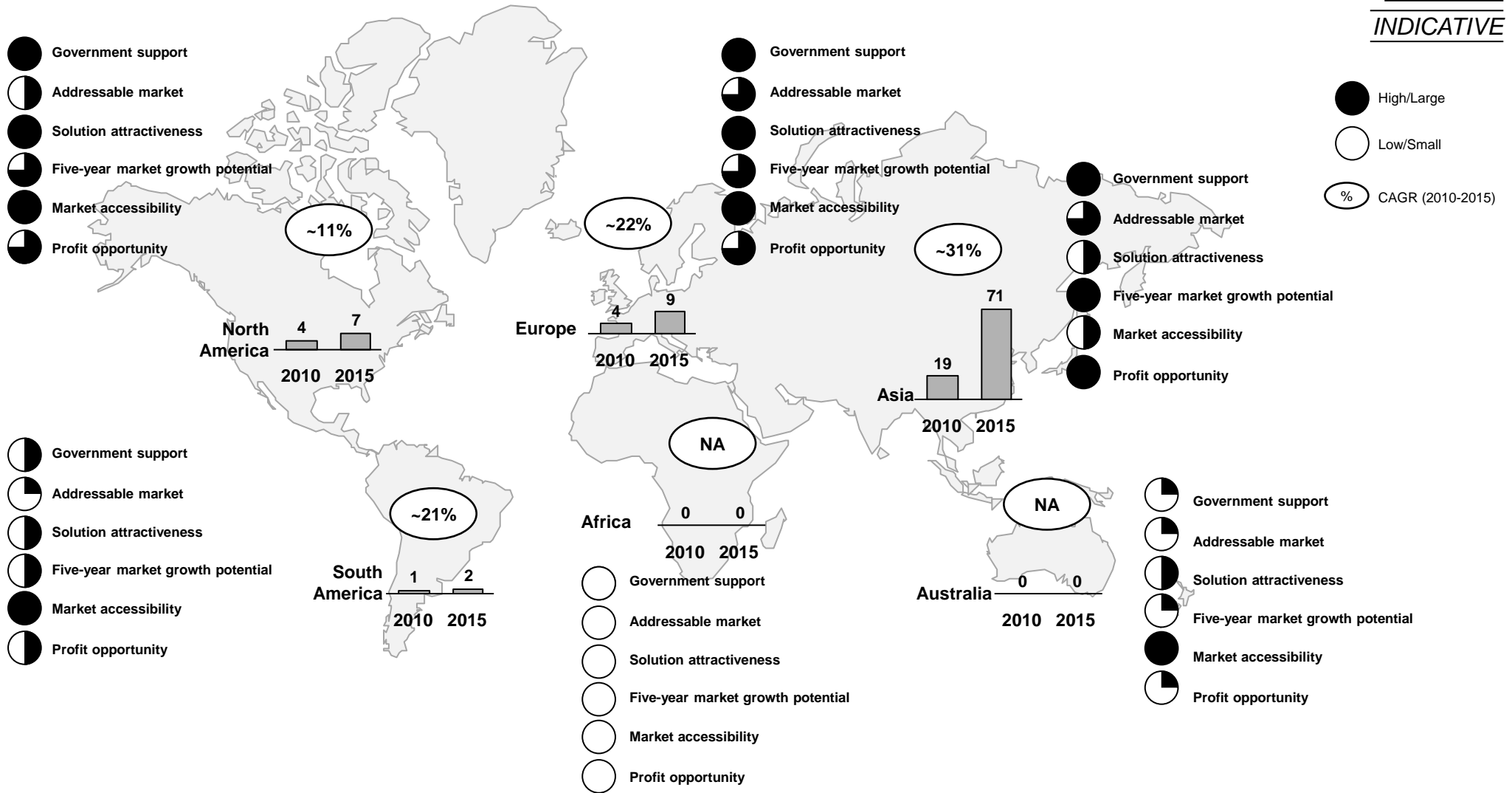


* Global price-erosion of 5% p.a., based on sample analysis of key turbine manufacturers, balancing out increase in number of GW installed p.a. in Asia

Asia (China) is expected to become the predominant **smart grid** market by 2015 growing rapidly from 2010 to 2015 and outpacing both Europe and North America

Smart grid – CAPEX Global market across regions, 2010-2015E (USD billions)

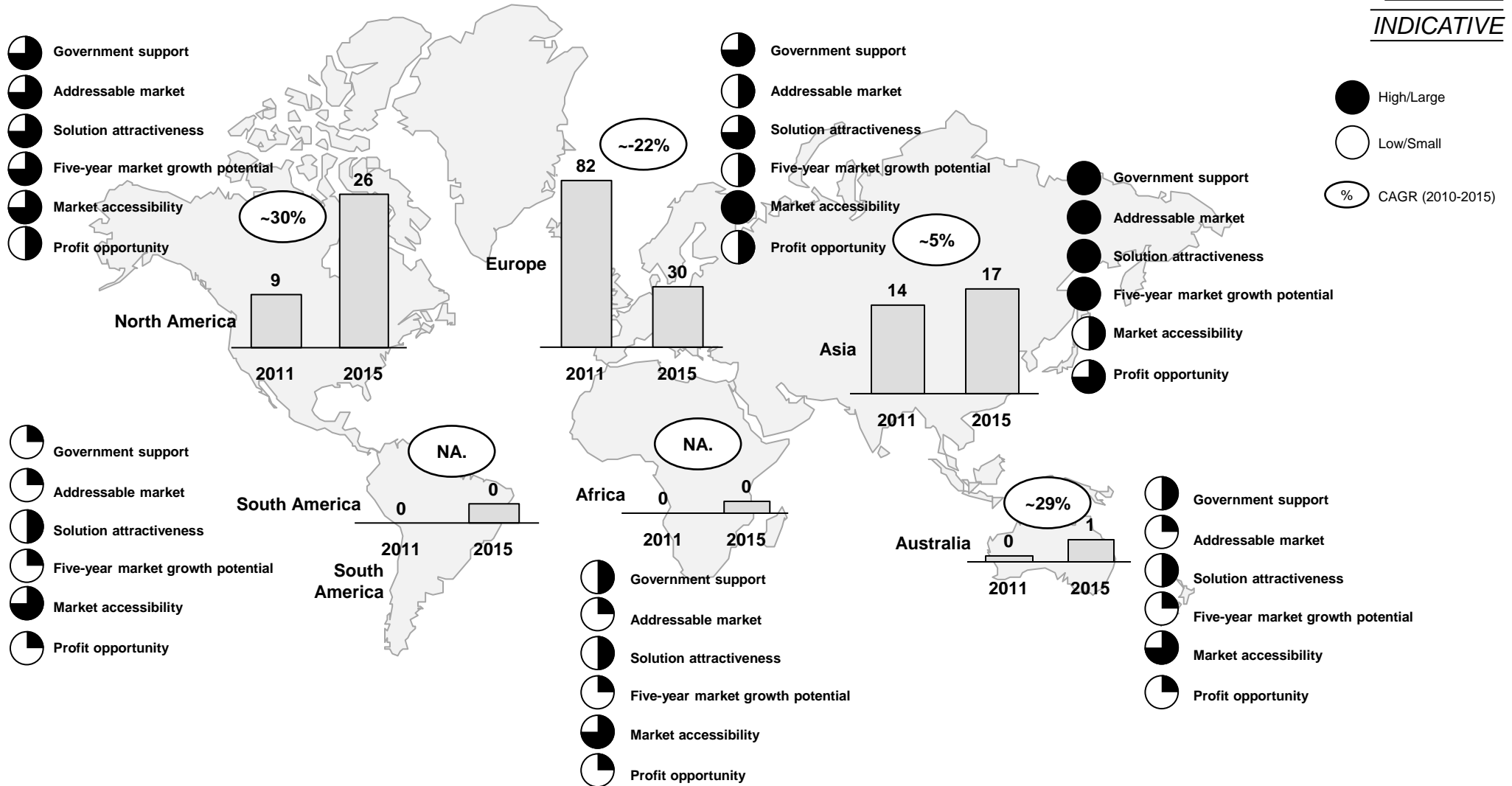
ESTIMATE
INDICATIVE



2011 was "PEAK Solar". Towards 2015 the European solar market will drop significantly while all other markets demonstrate strong growth led by North America

Solar energy – CAPEX Global market across regions, 2011-2015E (USD billions)

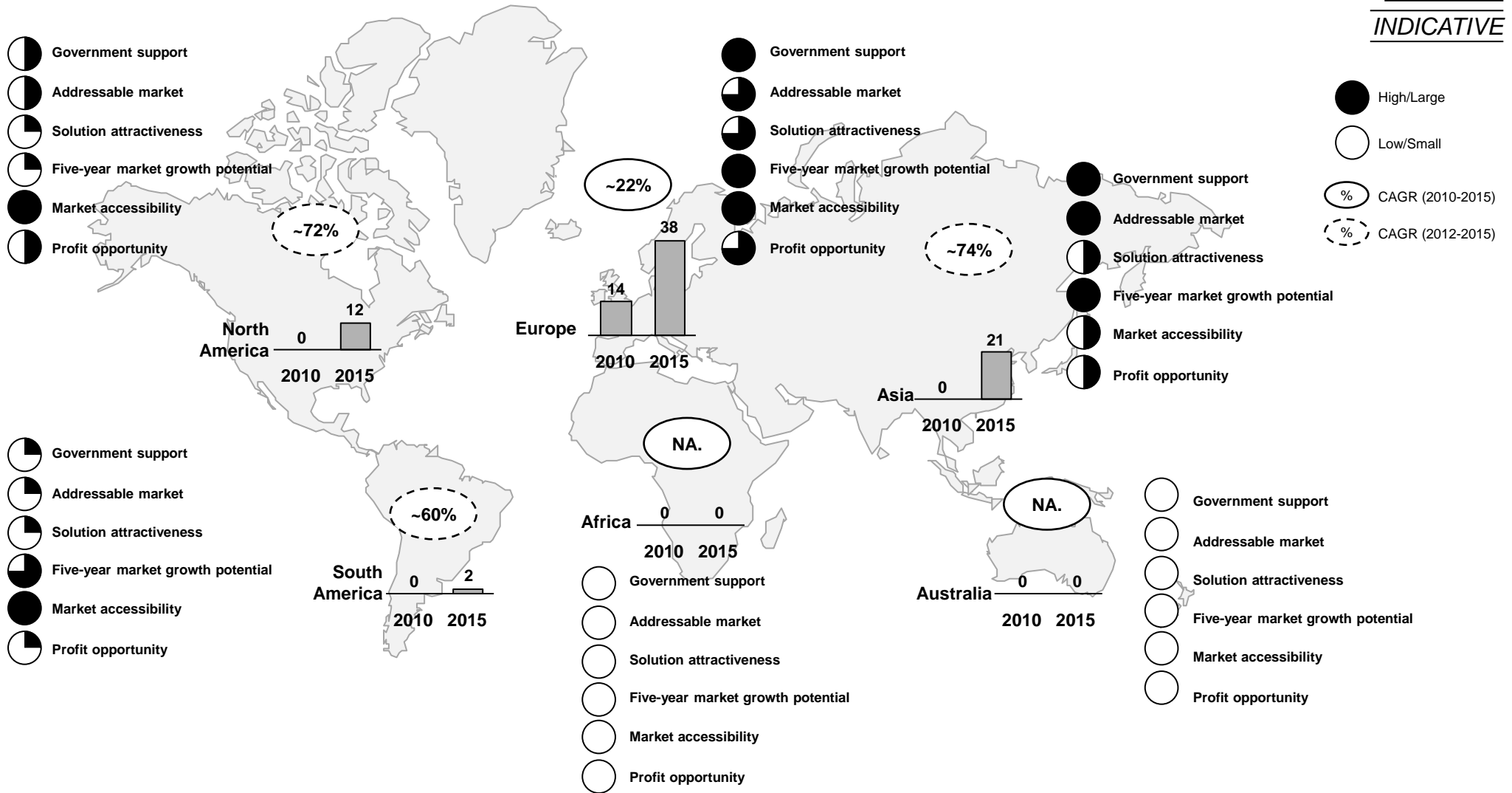
ESTIMATE
INDICATIVE



Northern Europe is projected to maintain its status as the largest **offshore wind** market in 2015 and Asia, North America and South America is projected to experience rapid growth

Offshore wind – CAPEX Global market across regions, 2010-2015E (USD billions)

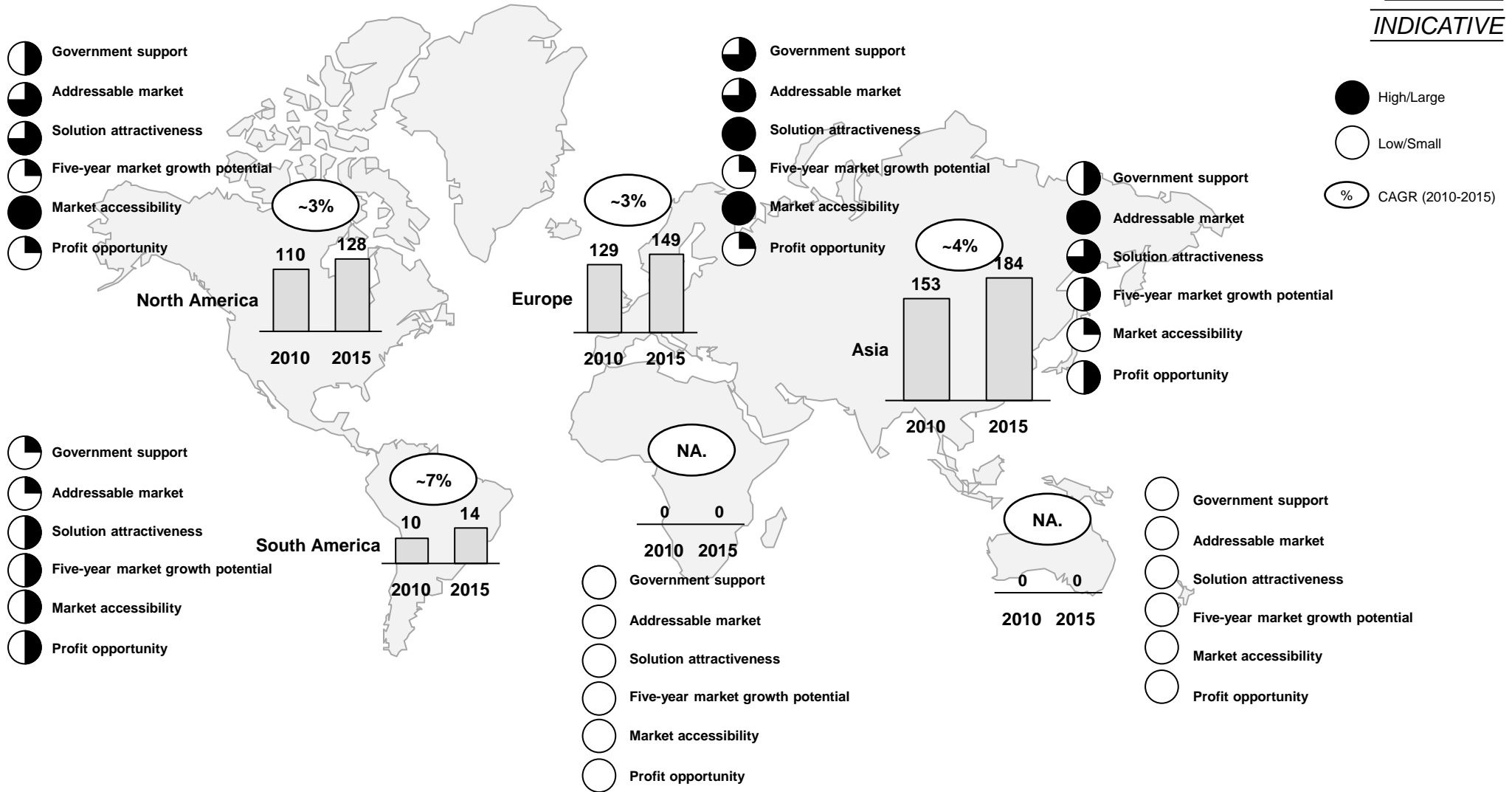
ESTIMATE
INDICATIVE



The global market for **solid waste management** is expected to grow from nearly USD 425 billion in 2005 to nearly USD 500 billion in 2020

Solid waste* – CAPEX and OPEX Global market across regions, 2010-2015E (USD billions)

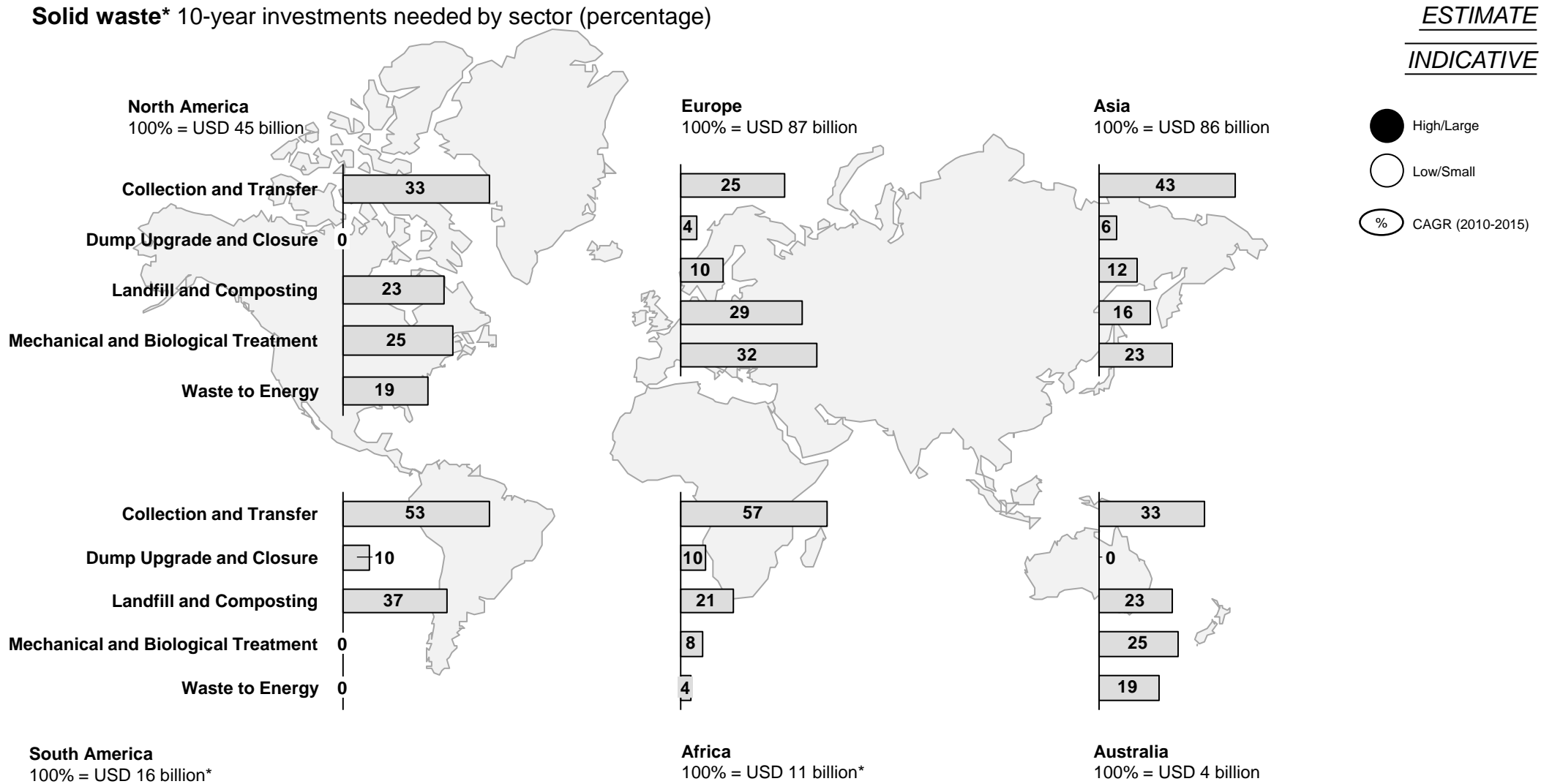
ESTIMATE
INDICATIVE



* The water market comprises expenditure on both equipment and services. The waste market for Africa is primarily comprised of investment into the collection services and hence has not been studied. The Australian market is comprised of only 2% of the global market and hence is considered too small to be considered for the study

More than 90% of the expenditure on solid waste is in services or operations. The new investments needed in the municipal waste management sector are only a fraction of the market size amounting to nearly USD 25-35 billion annually

Solid waste* 10-year investments needed by sector (percentage)

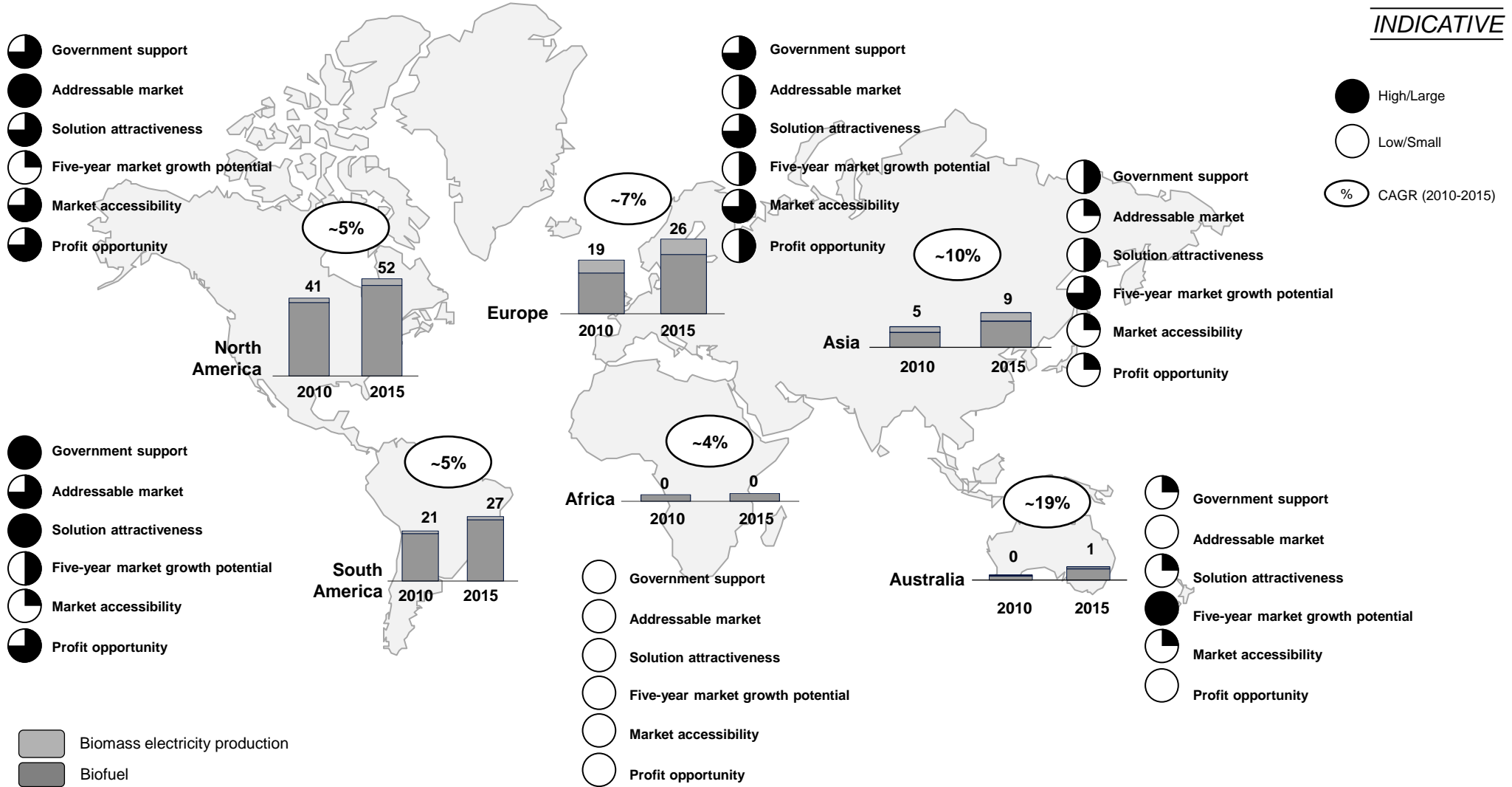


* This investment size might not be realised due to lack of policy and institutional support

North America to be the largest **bioenergy** market in 2015 followed by South America and Europe – Australia is growing rapidly

Bioenergy – CAPEX Global market across regions, 2010-2015E (USD billions)

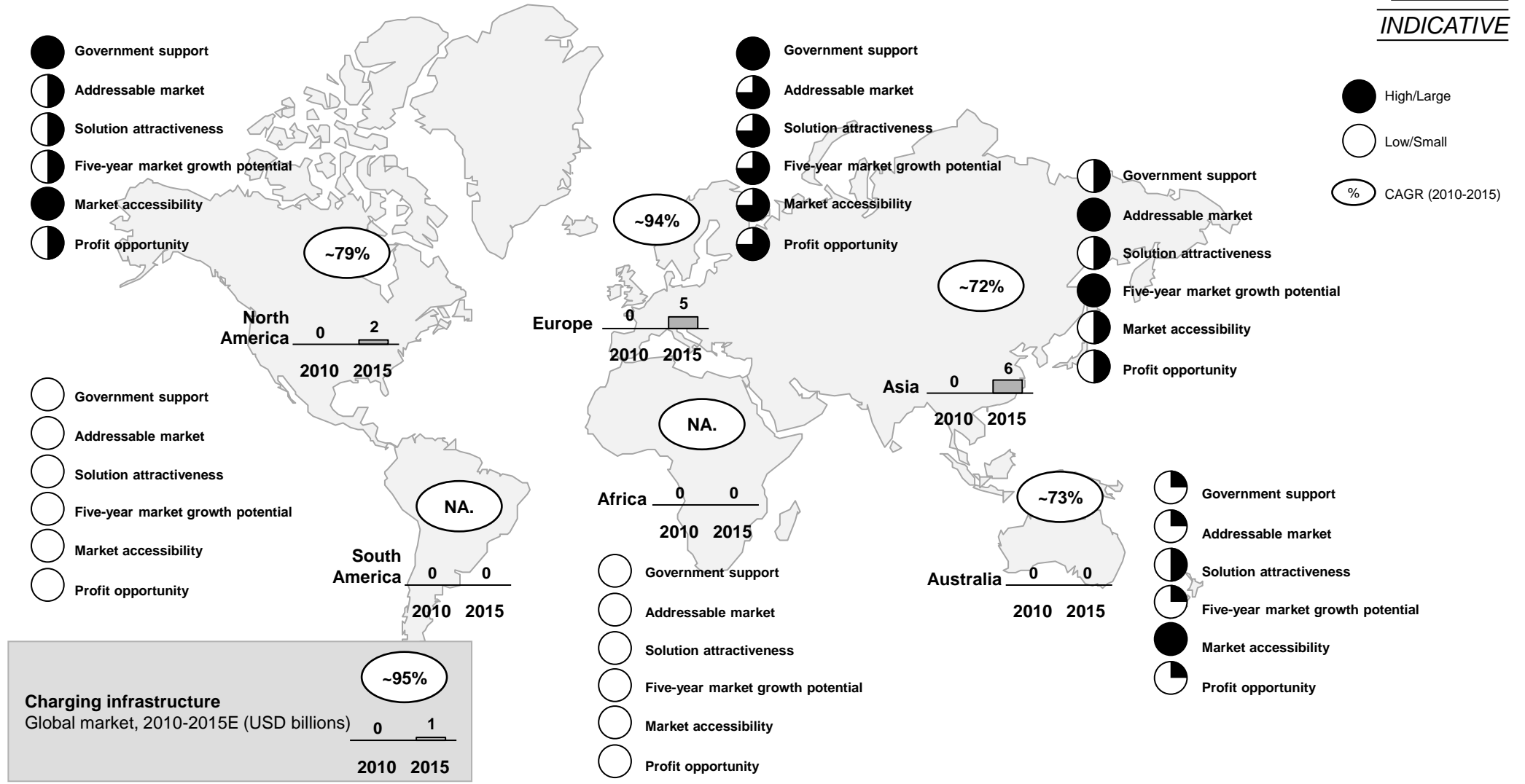
ESTIMATE
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Asia and Europe are expected to become the leading EV and PHEV markets looking towards 2015 followed by North America

EV and PHEV – CAPEX Global market across regions, 2010-2015E (USD billions)

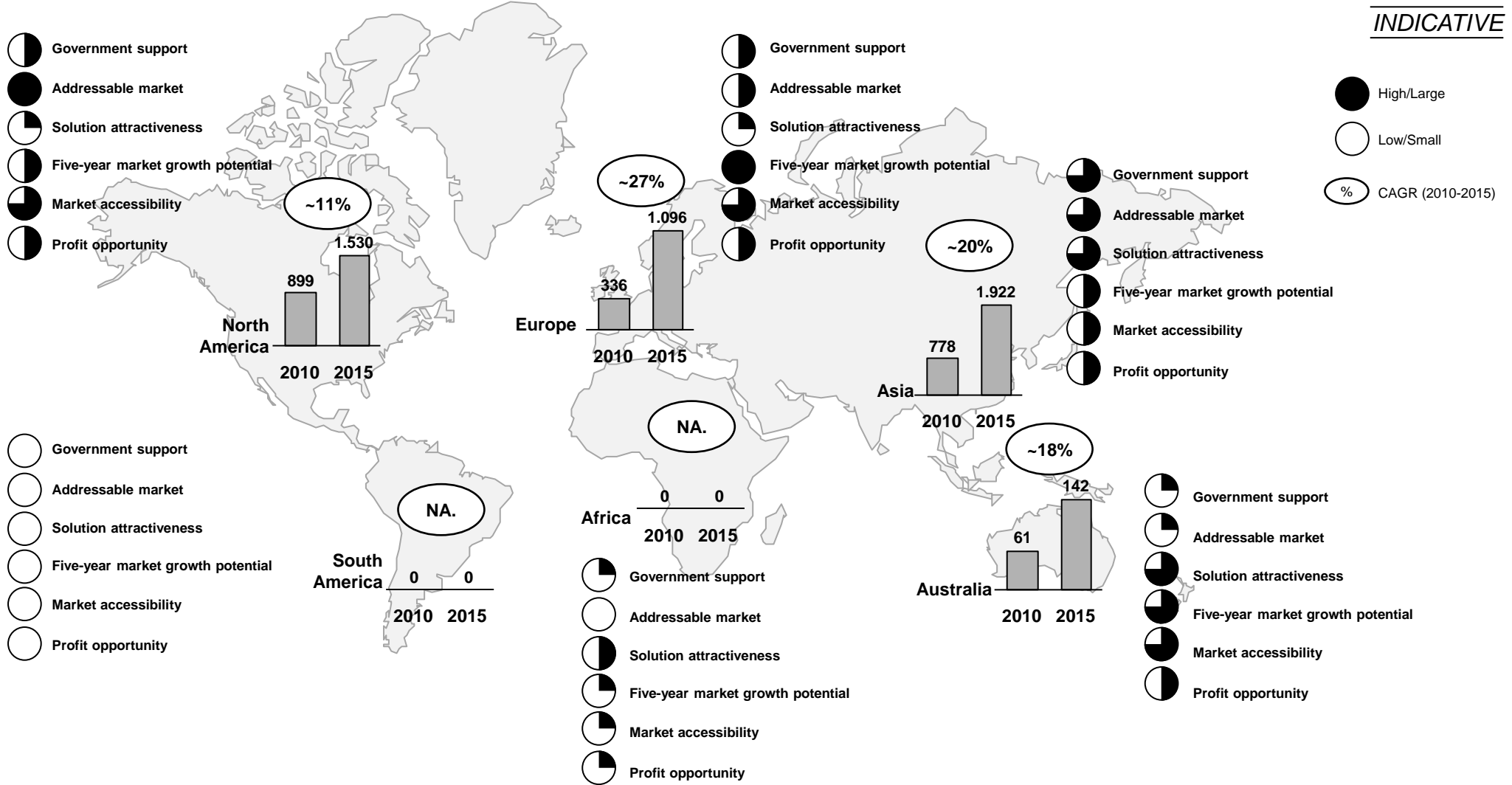
ESTIMATE
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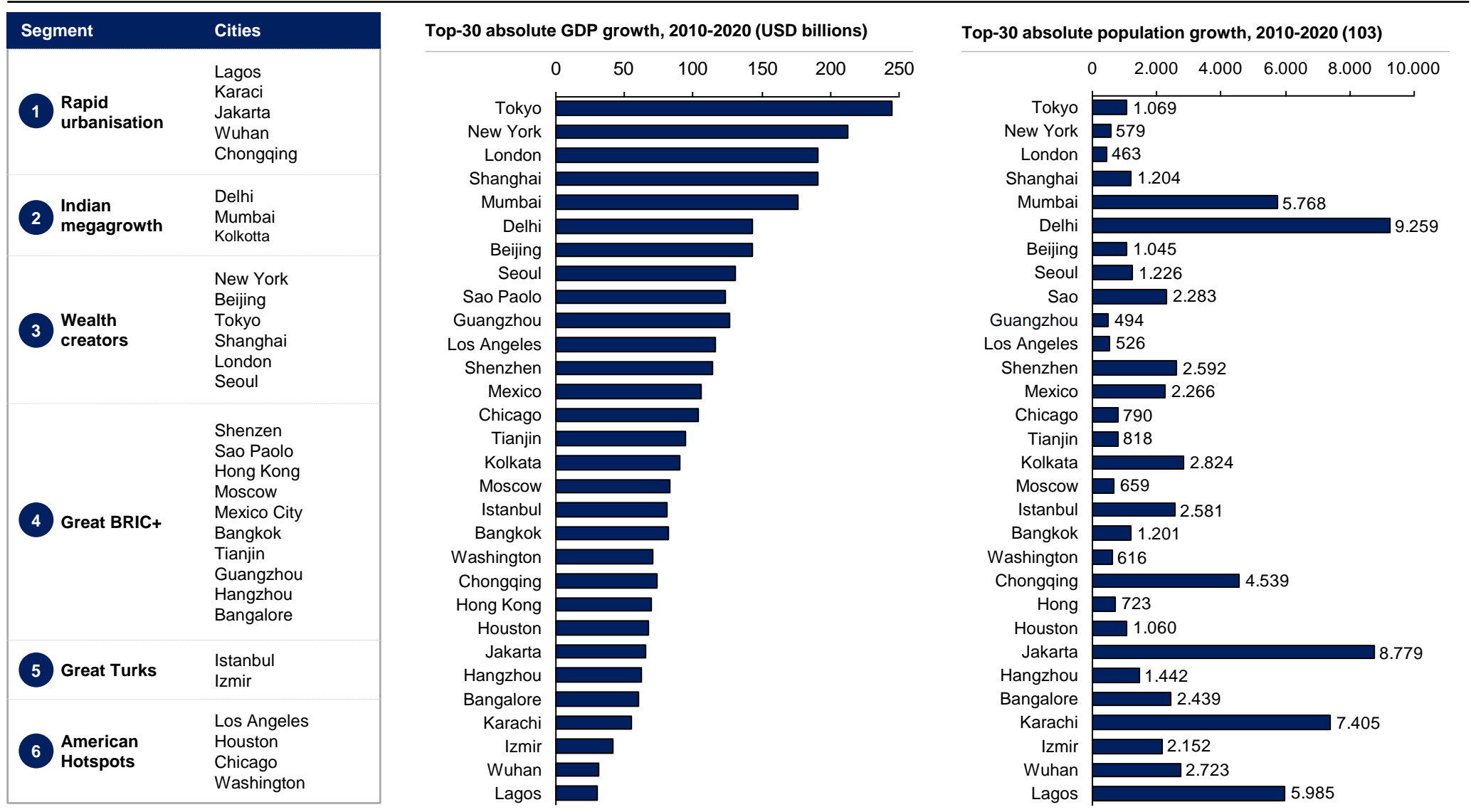
Asia is poised to become the largest **geothermal** market in 2015 followed by North America and Europe

Geothermal – CAPEX Global market across regions, 2010-2015E (USD millions)

ESTIMATE
INDICATIVE



The top-30 megacities can be divided into six cleantech clusters with the Great Turks growing at the same pace as Great BRIC+



Note: The majority of these cities have set Eco city targets for e.g. emissions and have Eco city projects under way