



# CAREC ENERGY INVESTMENT FORUM FINANCING FUTURE ENERGY

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## Renewables and electric mobility as drivers of long-term growth

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Costa Rica Limpia and Nivelada

# Outline

1

## **Trends**

Clean energy &  
transportation

2

## **Case**

Costa Rica's 100%  
renewable power

3

## **CAREC**

Investing in cleaner  
growth

# Trends

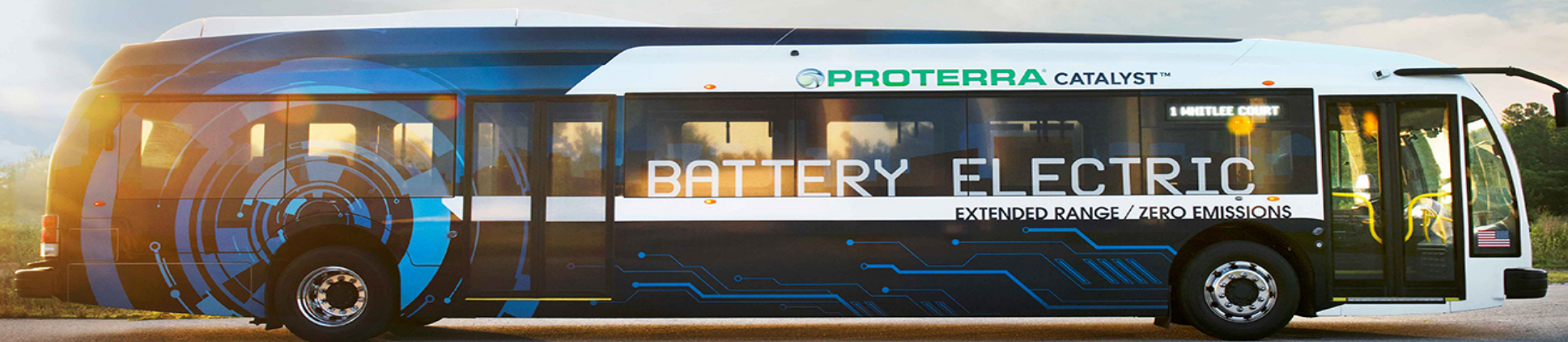
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An energy and transport revolution is underway





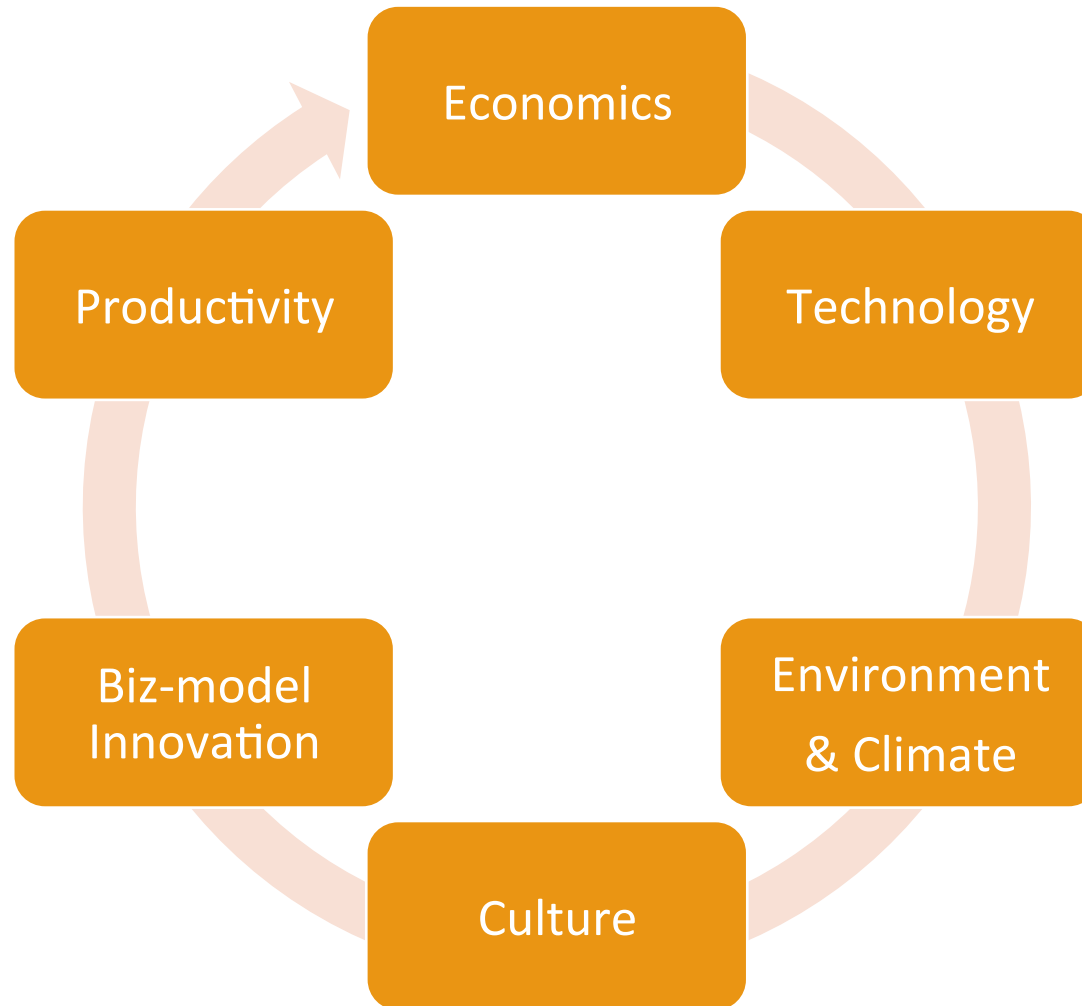




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# Mega trends are transforming energy systems



Drivers	Logic	Examples
<b>Environment/ Climate</b>	Rising political action to tackle climate change, pollution and unsustainable resource use	<i>Paris Agreement, green cities</i>
<b>Economics</b>	Oil prices volatility. Renewable energy job creation. Economies of scale.	<i>Cheaper solar panels, green jobs</i>
<b>Technology</b>	Better and cheaper technologies making renewables & electric vehicles competitive with old technologies.	<i>Smarter grid and cars</i>
<b>Business-model Innovation</b>	Entrepreneurs find new ways to meet customers' energy and mobility needs.	<i>"Zero money down" energy services</i>
<b>Culture</b>	Empowered consumers breaking free from traditional energy and transport models.	<i>Tesla solar home</i>
<b>Productivity</b>	Infrastructure operators seek new strategies to meet needs at lower cost.	<i>E-buses, Demand-side flexibility</i>



Renewables  
are good for  
growth,  
health and  
job creation

**A decarbonized energy sector by 2050, in line with the Paris Agreement, is feasible and attractive.**

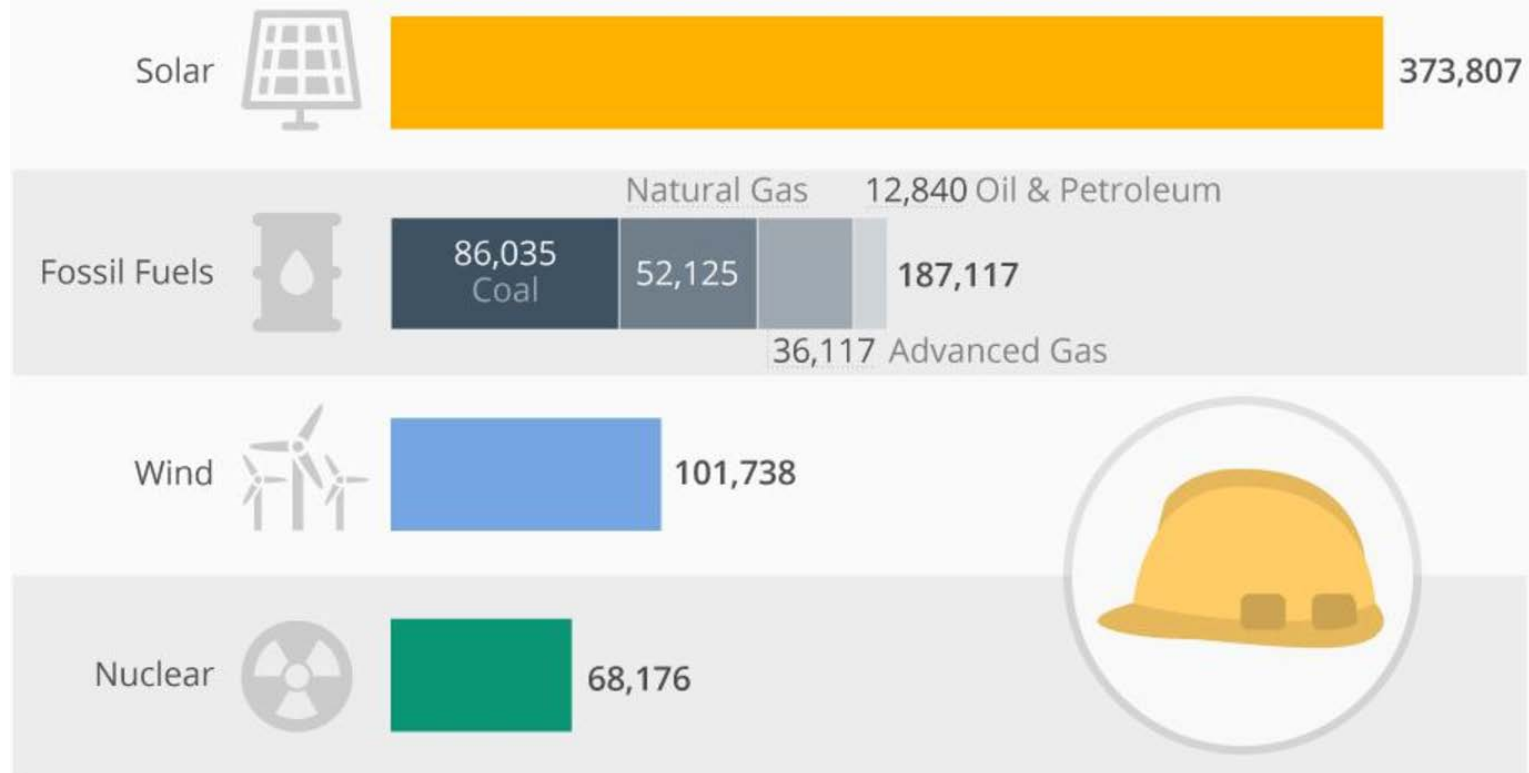
- 0.8% growth of GDP, \$19 trillion in activity.
- \$29 trillion investments needed to 2050.
- Savings from less air pollution and climate change.
- Savings exceed costs by a factor of 2-6 in 2050.
- 26 million jobs by 2050 (from 10 million today).

2016 was the strongest year ever for **new** renewable energy capacity additions,

- Generating capacity increased by 161 gigawatts in 2016...
- **...over half of it came from developing countries.**
- Since 2009, solar PV module costs fell by 80% since 2009, wind turbine costs  $\sim 1/3$ ...
- ...because of cost declines, more power is received per \$1 invested.
- Investment in renewables reached a record \$348 billion in 2015.

# Solar Employs More Workers In U.S. Power Generation than Oil, Coal & Gas Combined

Employment in energy generation by source in the U.S. in 2016



@StatistaCharts Source: U.S. Department of Energy

Forbes statista

Source: US Energy & Jobs Report [https://www.energy.gov/sites/prod/files/2017/01/f34/2017%20US%20Energy%20and%20Jobs%20Report\\_0.pdf](https://www.energy.gov/sites/prod/files/2017/01/f34/2017%20US%20Energy%20and%20Jobs%20Report_0.pdf)



# The mega trend is going global

China

- will invest \$361 billion in renewable power generation by 2020.

India

- 175 gigawatts (gw) in renewable energy generation by 2022

Saudi Arabia

- will attract \$50 billion of investment in renewables by 2030 (and deploy 9.5 GW by 2023)

Russia

- will have its largest-ever renewable energy auction of almost 2 GW.

250 US mayors

- committed to 100% renewable energy.

96 corporations

- committed to using 100% renewable electricity

40 vulnerable countries

- adopted 100% renewable targets

# The mechanisms through which **renewables** could shape international politics are mostly positive

**Critical  
material  
supply  
chains  
(-)**

**Electric  
grids**

**Reduced oil  
and gas  
demand**

**New  
resource  
curse  
(-)**

**Avoided  
climate  
change**

**Energy  
access**

**Technology  
& finance**

# As the transition to renewables proceeds. . .





# Electric transport as a driver of sustainable mobility

- Growing demand for improved air quality
- Green city initiatives pushing for e-buses
- Battery cost decline lowers electric-car prices
- Ongoing charging infrastructure innovation
- EVs help unlock the renewable energy potential

# Electric cars are going global

## China

- Has 115,000 electric bus and is the largest market for electric cars in the world.

## India

- Will only sell electric cars by 2030

## Norway

- 42% of new sales are electric cars and plug-in hybrid electric car, highest in the world

## France

- Will ban gasoline and diesel cars by 2040

## The Netherlands

- Exploring a ban on gasoline and diesel cars by 2025

## Government of California

- Early champion on zero emissions transportation

## Clean Bus Declaration C40

- Majors of cities (C40) commit to buying electric buses and to negotiate lower prices

## Chile, Argentina, Costa Rica

- Chile & Argentina grasp lithium/copper opportunity. Costa Rica drafted EV incentives law

# By 2040, 45% of global car sales will be electric, says Bloomberg NEF experts

## Tesla

- 500,000 cars sold by 2018. 1 million annually by 2020.

## Volvo

- Shift to electric and hybrid cars by 2019

## BMW

- Electric cars will account for 25% of their sales by 2025.

## Volkswagen & Audi

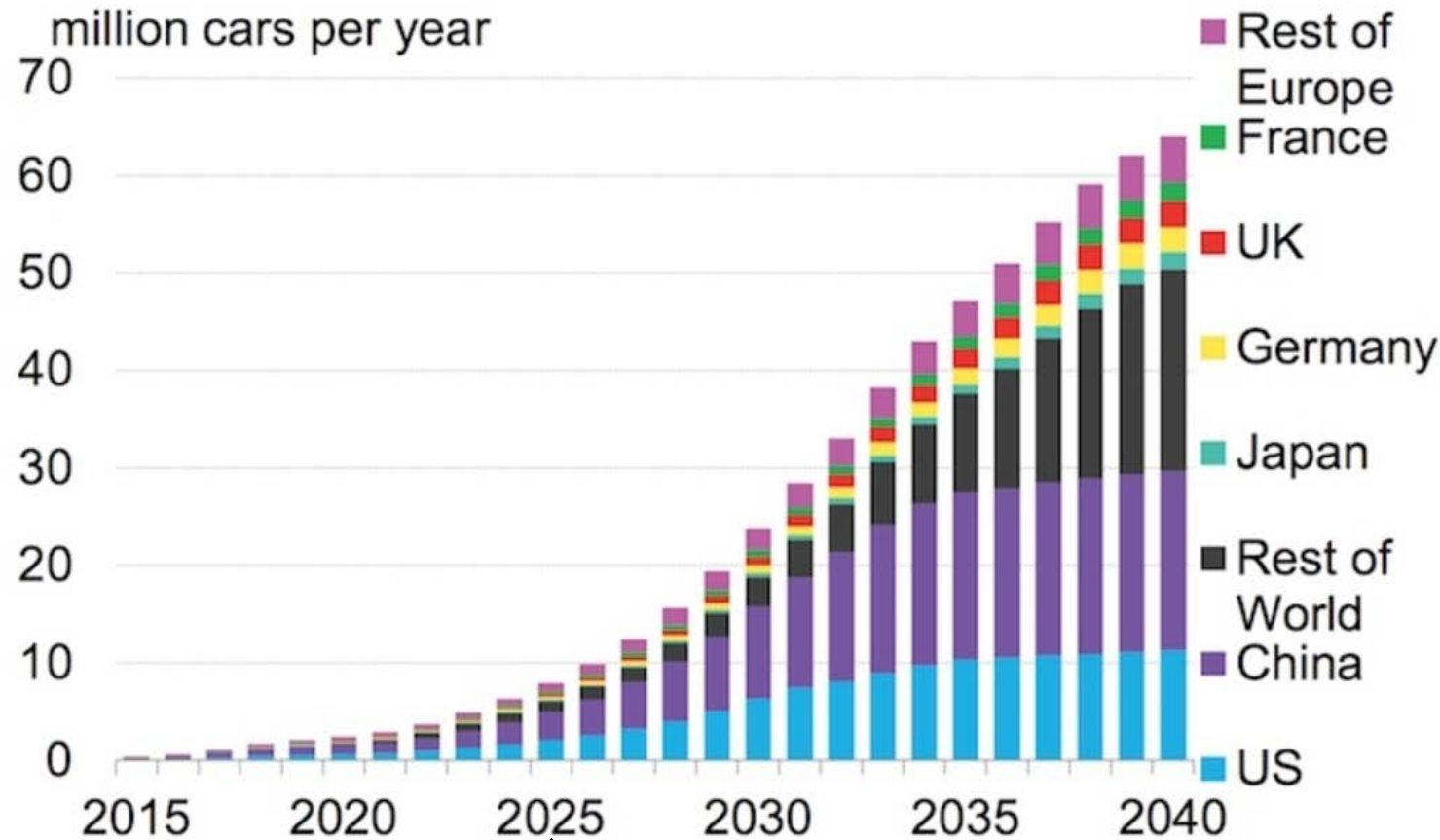
- “Diesel scandal” settlement in the US pushed toward electrification: 4 EVs in 2020
- Audi: first all-electric by 2018

## Daimler

- EUR 10 billion investment to develop 10 EVs by 2022



# Electric cars to reach price parity by 2025



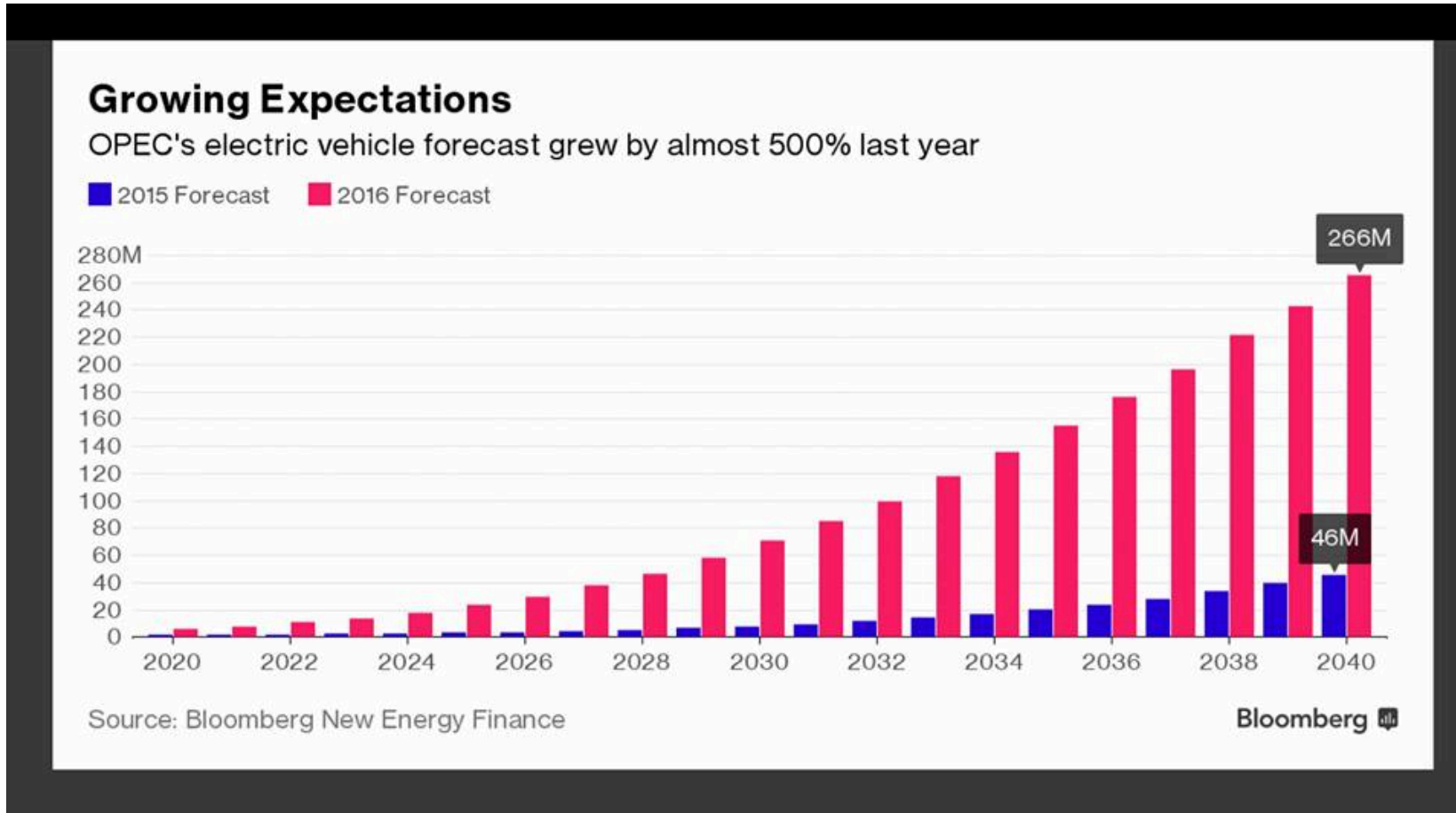
Price parity with gasoline cars

530 million total electric cars forecast to be on the road by 2040.

It means 8 million fewer barrels of oil a day to run.

# **Big Oil Just Woke Up to Threat of Rising Electric Car Demand**

# OPEC had to review its electric vehicle forecast last year...



# New investments in highly polluting energy sources need a reality check

- Policies and market demands will have impacts
- Changes in energy systems faster than expected
- Investor community supports climate action
- The reality of “unburnable carbon” is scientific
- The economic benefits of cleaner development

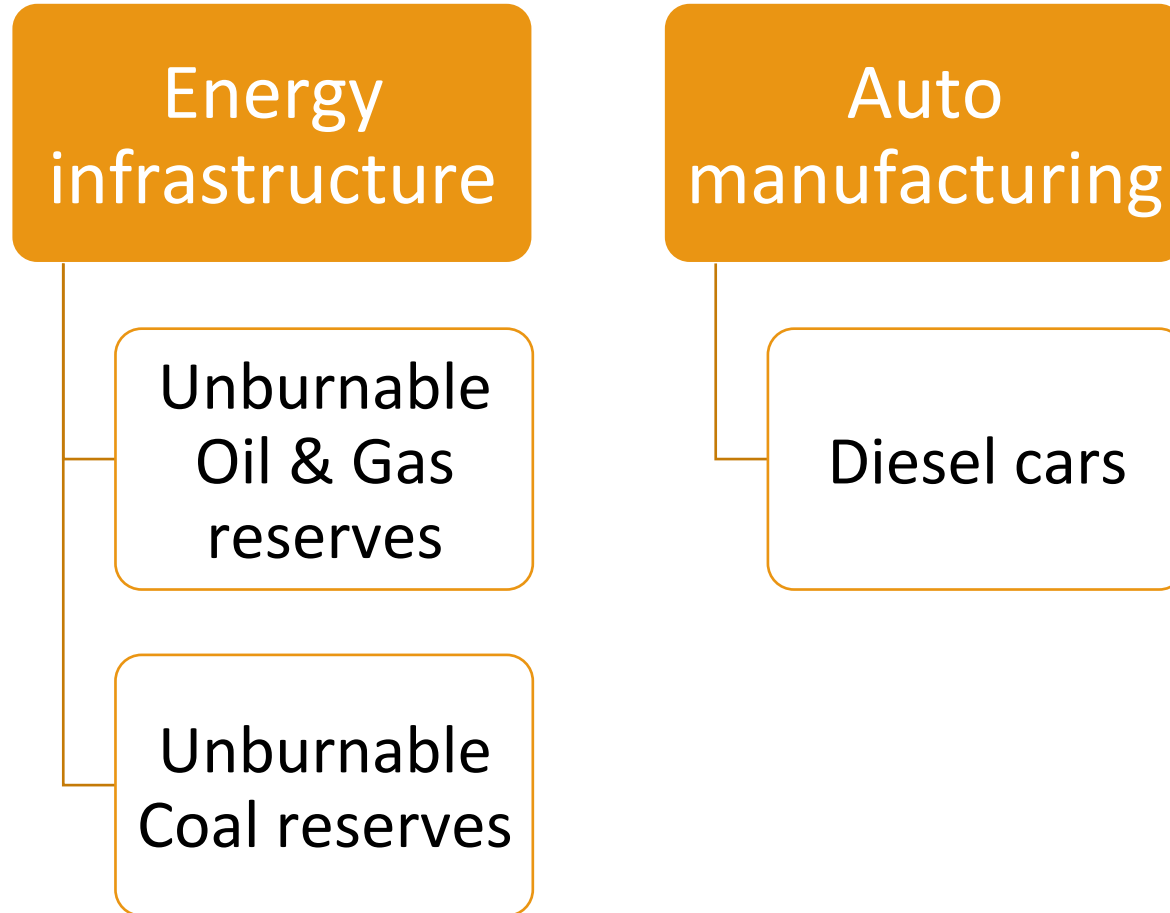


# **The Slow Death of Diesel**

**By Chris Bryant**

Source: Bloomberg

**Stranded assets:** the risk of investing in assets today that aren't needed or allowed in the future





# Clean is Good

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Making clean, bold choices pays off. The case of Costa Rica.











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© Mauricio Ramírez



© Esteban Bermudez



© Enertiva



© Pelletics



POLITICS

# Costa Rica's Green Energy Feat Shows Hope For The Planet

Almost all the energy produced in the developing country this year came from renewable sources.

🕒 12/22/2015 07:57 pm ET



# As of this July, “Costa Rica’s brand shows highest growth in Latin America”

- Country Brand Ranking of 2017-2018.
- “*Essential Costa Rica*” increased 12 places in tourism.
- Increased 5 places in trade and investment
- Official site:  
[essentialcostarica.com/](https://essentialcostarica.com/)

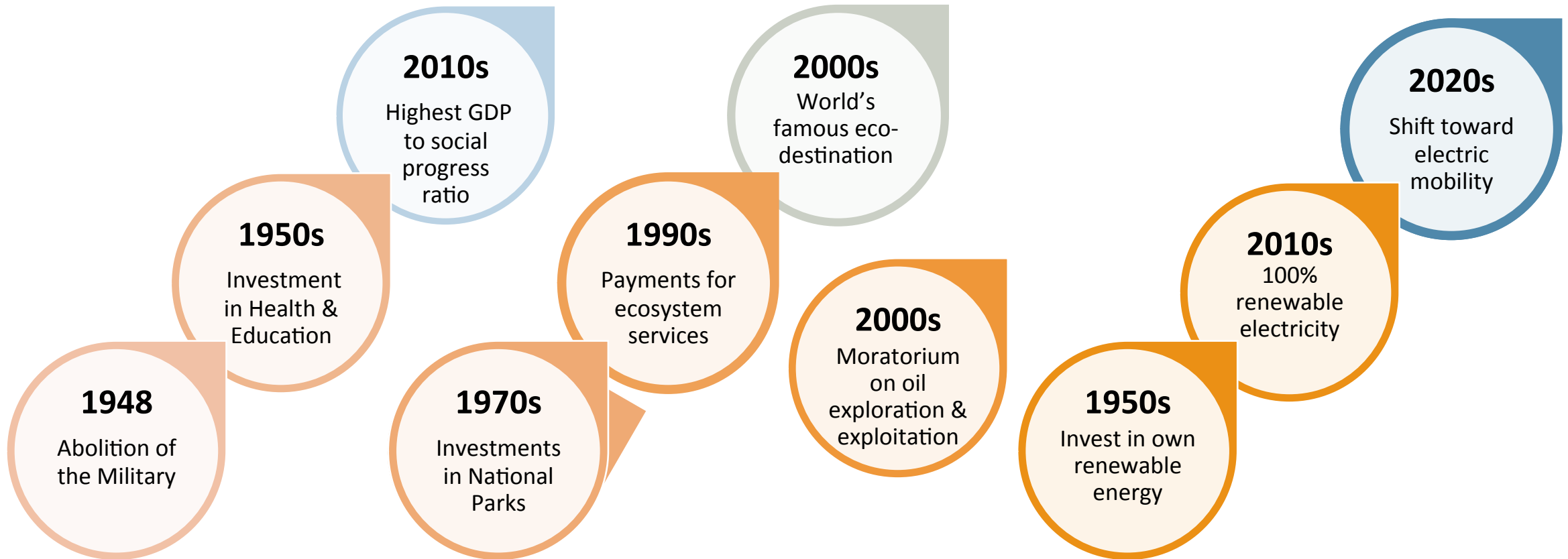




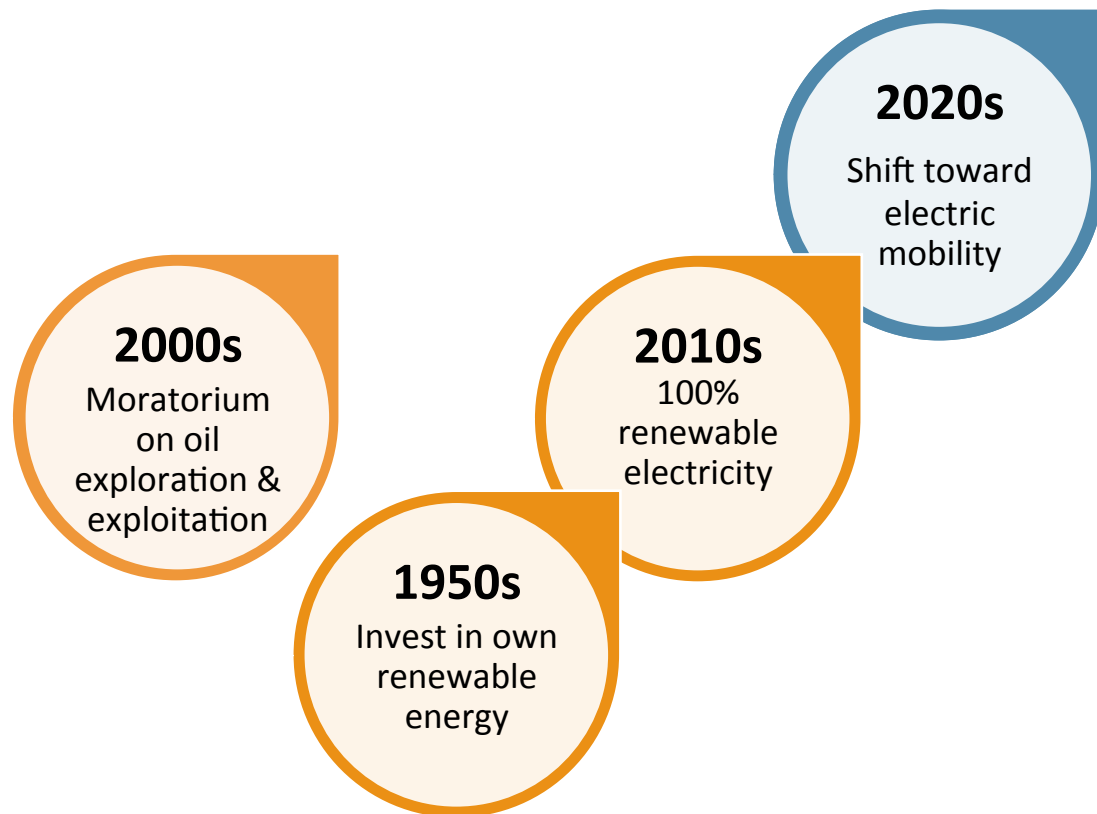


Costa Rica's Christiana Figueres, played key role in the Paris Agreement. We need to protect this legacy by being an example.

# Costa Rica: Making **clean**, bold choices pays off

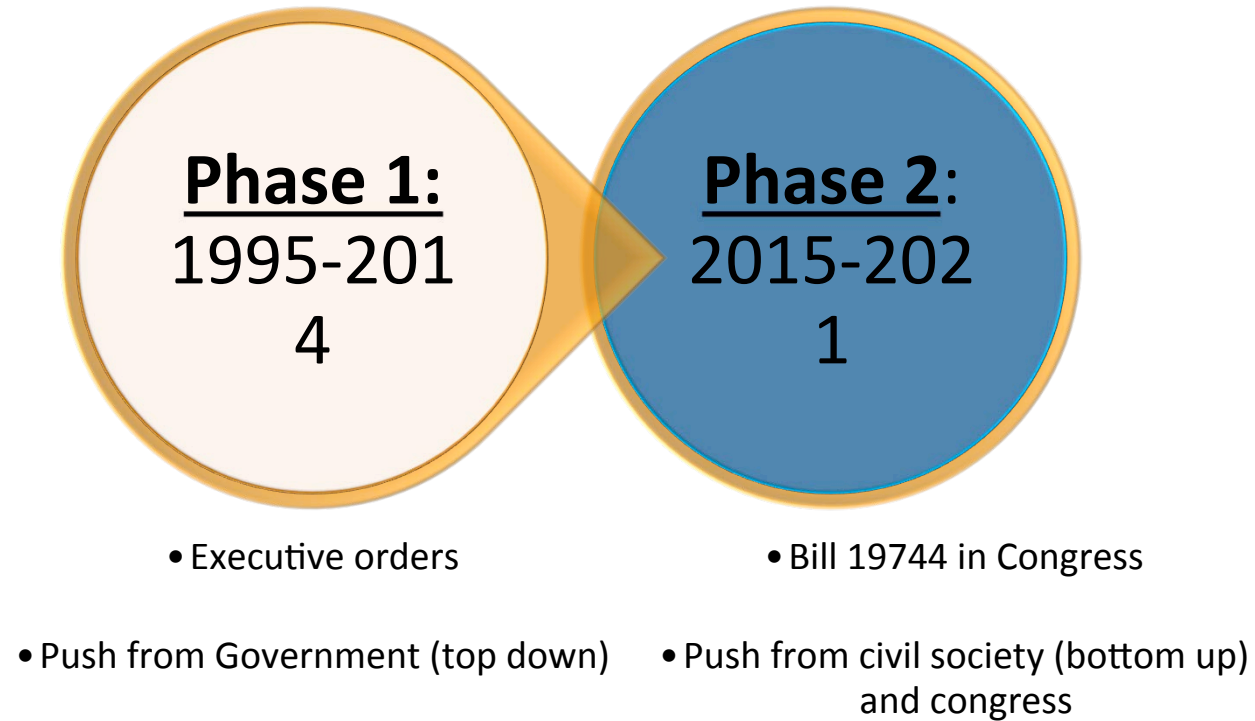


# Why keep importing fossil-fuels if we could power transport with our own, clean electricity?



- Fossil fuels cause climate change and we are vulnerable to climate impacts.
- We must electrify our transportation if we are to meet our Paris target
- Zero emission cars, buses and trains will improve urban air quality.

Electric transport was first promoted in mid-1990s and **a new phase** started in the run up to Paris



# Some developments are underway

## Law proposal in Congress

- Executive order from 1990s gives tax incentives and creates electric transport department at national utility. Electric bus is being tested.

## EV incentives in exe. orders

- Executive order gives incentives to cleaner cars. Draft law 19744 : EVs will not pay neither taxes nor registration fee

## EV charging infrastructure

- 20 charging points have been installed. 10 additional points in 2017. Korea donated 3 charging stations.

## Electric bus testing

- National utility is testing an e-bus

## Electric train proposal

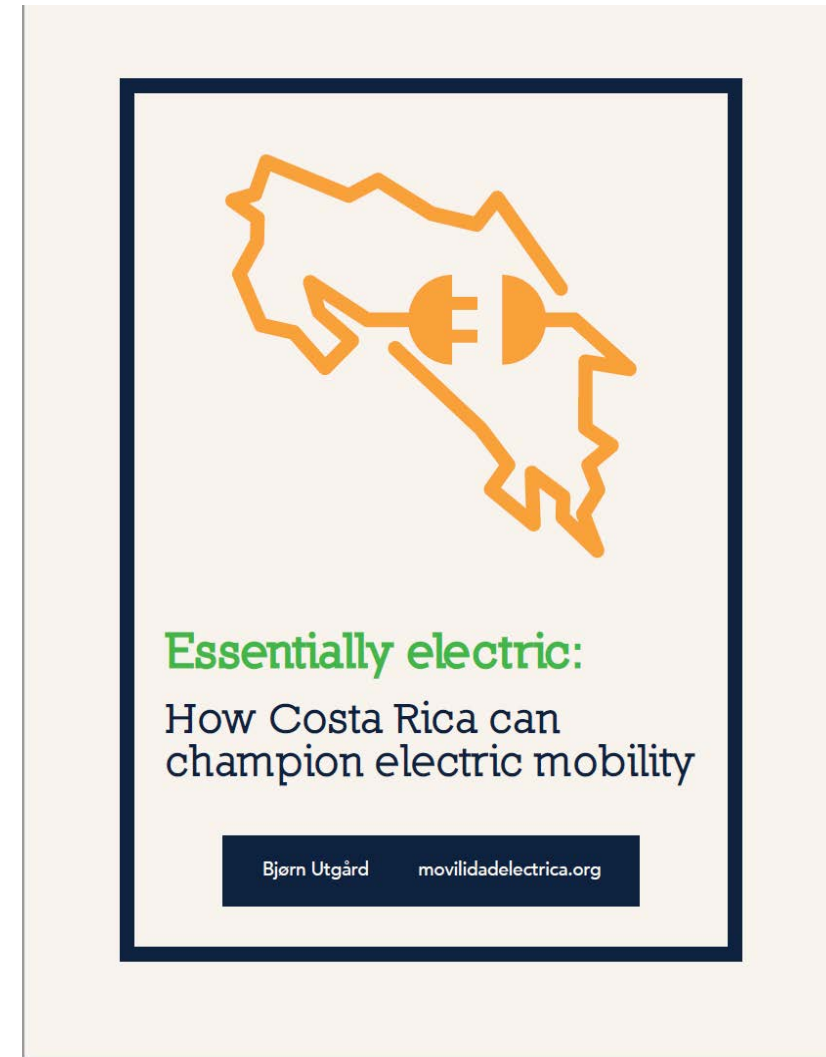
- The Government has announced new plans to invest in a light train for city passengers

## State purchases of EVs

- State owned power utility will buy 100 electric cars by 2018.

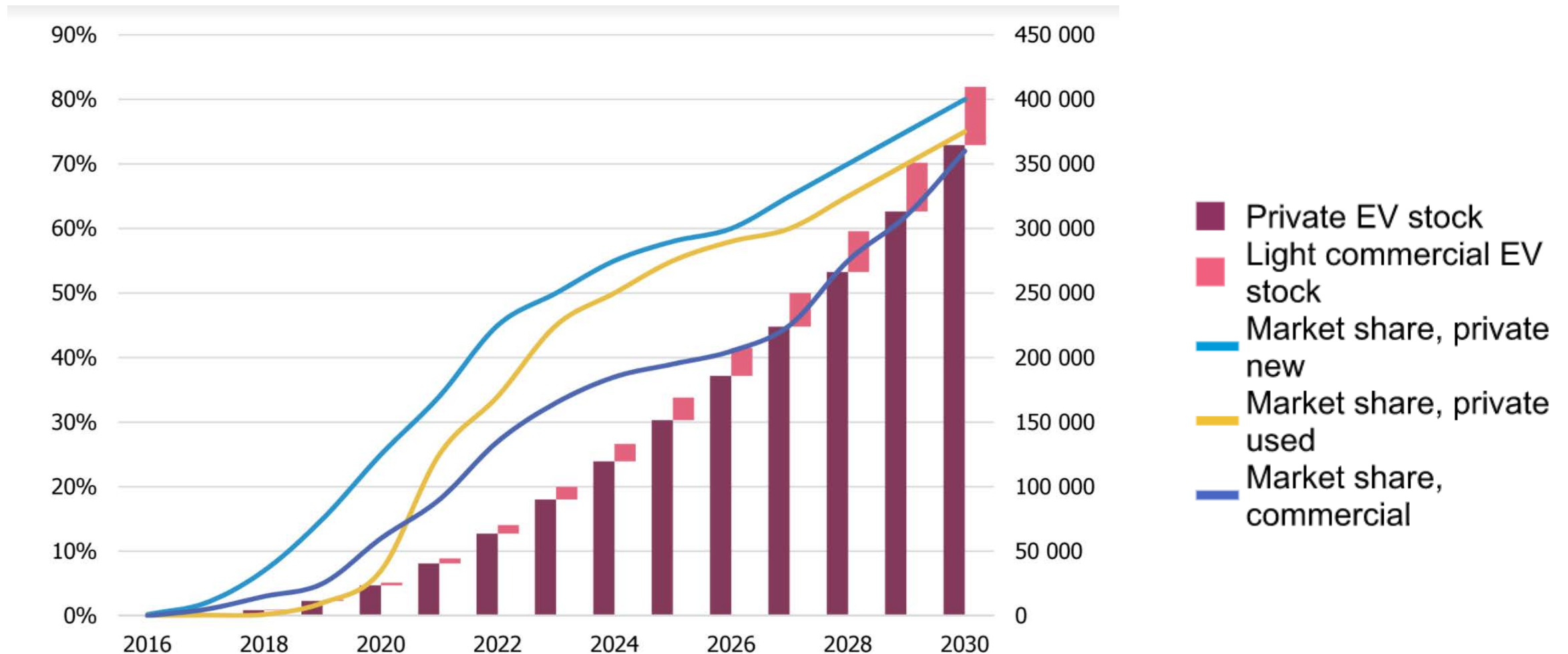
# “Essentially Electric”

## Our input to the national debate



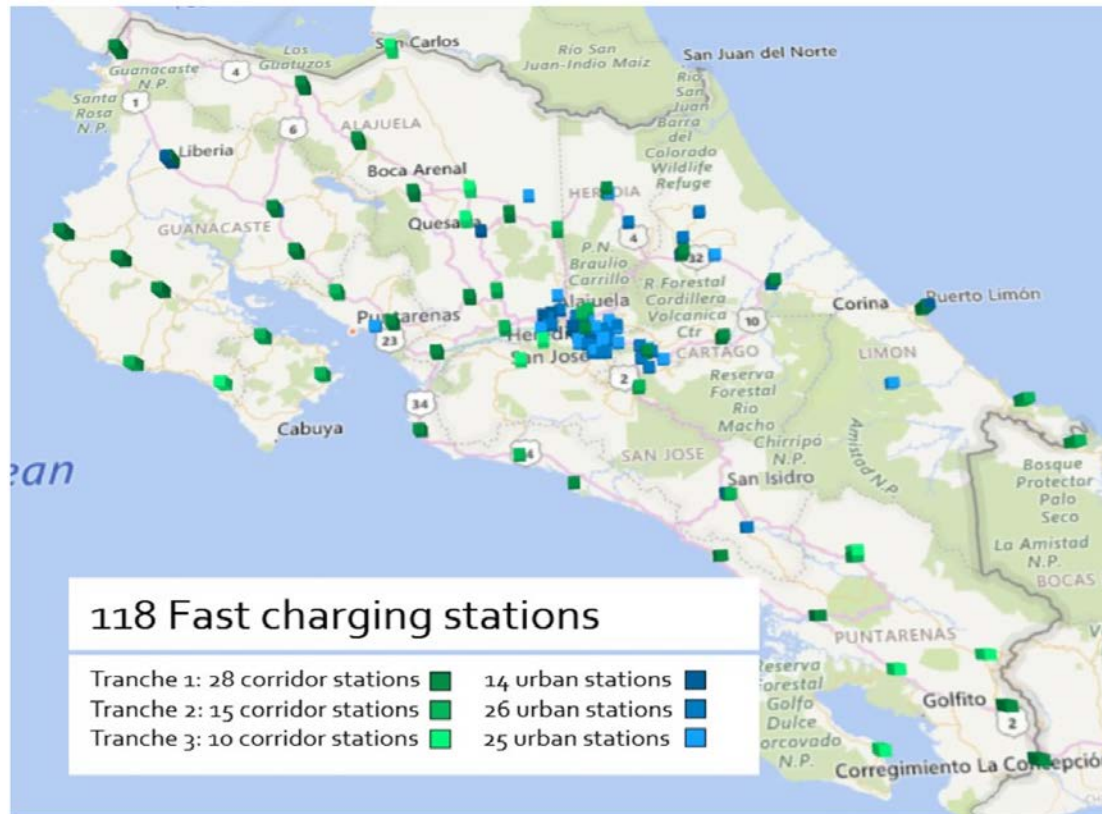


# 2030 projection for Costa Rica: 410,000 EVs sales



Fuente: Utgard, Bjorn 2017 "Essentially Electric, How Costa Rica Can Champion Electric Mobility"

# Projected (corridor and urban) charging stations in Costa Rica, split into investment tranches



Type	Stations	Chargers	Investment
Corridor	53	136	\$6,800,000
Urban	65	130	\$6,500,000
<b>Total</b>	<b>118</b>	<b>266</b>	<b>13,300,000</b>

Fuente: Utgard, Bjorn 2017 “Essentially Electric, How Costa Rica Can Champion Electric Mobility”





Electric-bus citizen tour  
organized by our organization  
Costa Rica Limpia







Example of fossil-free Costa Rica event with 1,100 watching it LIVE







Monica Araya:

# A small country with big ideas to get rid of fossil fuels

TEDSummit · 15:52 · Filmed Jun 2016

 28 subtitle languages 

 View interactive transcript

[For VIDEO click Ted.com](https://www.ted.com/watch/monica-araya-a-small-country-with-big-ideas-to-get-rid-of-fossil-fuels)





# Ideas for our electric mobility strategy: Think Big

Set an ambitious national goal

No need to start from scratch

Use mobility to reinvent eco-tourism

Engage relevant stakeholders

Turn Costa Rica into a Latin American EV hub

# CAREC's choices

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Rethinking energy and transport in light of mega trends

Because of oil & gas reserves, the risk of path dependence and stranded assets exists



Afghanistan

Azerbaijan

China

Georgia

Kazakhstan

Kyrgyzstan

Mongolia

Pakistan

Tajikistan

Turkmenistan

Uzbekistan



The energy and transportation transition is happening now and any fossil fuel investments will be at risk in the coming years.

Leapfrogging in CERAC countries.

Transition is happening faster than expected, so action should start now, otherwise the old economies will be hurt.



Mistakes made by developed countries don't need to be repeated.



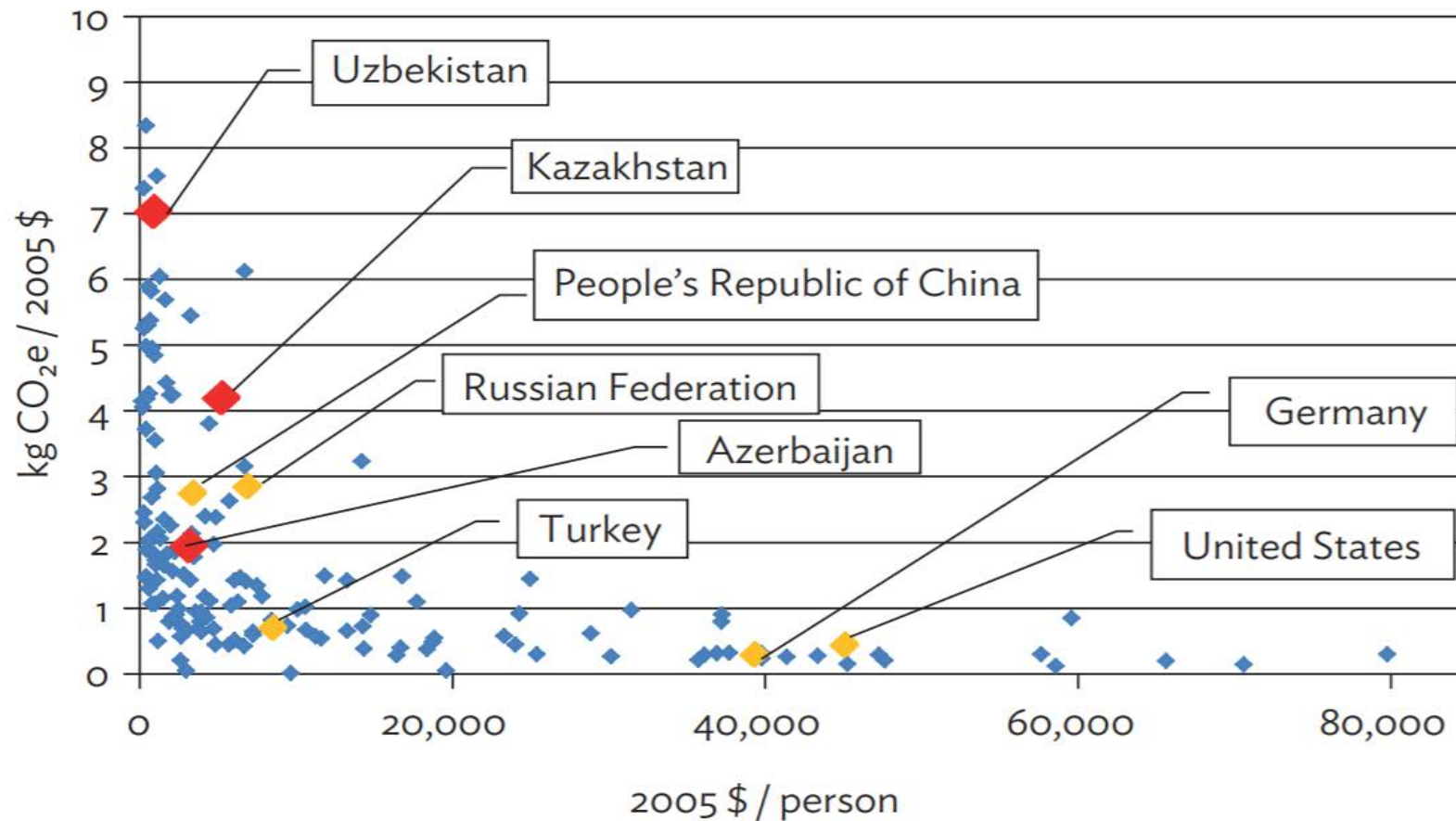
Cleaner choices are technically feasible and economically attractive.

# One of Kazakhstan's objective



**“To become  
one of the 30  
most  
developed  
countries in the  
world by 2050.”**

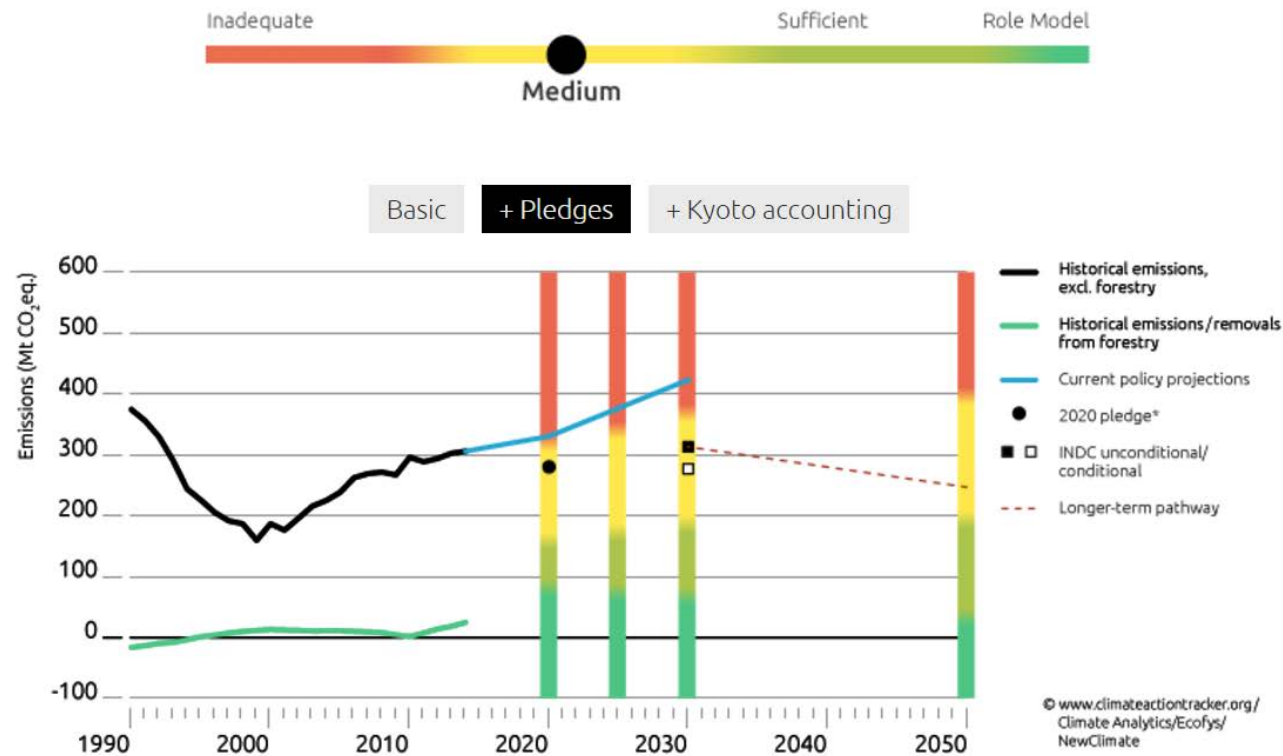
# Carbon intensity of GDP is high.



- Contribution to global carbon emissions is small
- But compared to countries with similar per capita income, some CERAC countries show relatively **high** carbon intensity of GDP.
- 75% of total 2010 GHG emissions for these 3 CERAC countries come from **energy & transport**.



# How to assess Kazakhstan's Paris climate target to 2030?

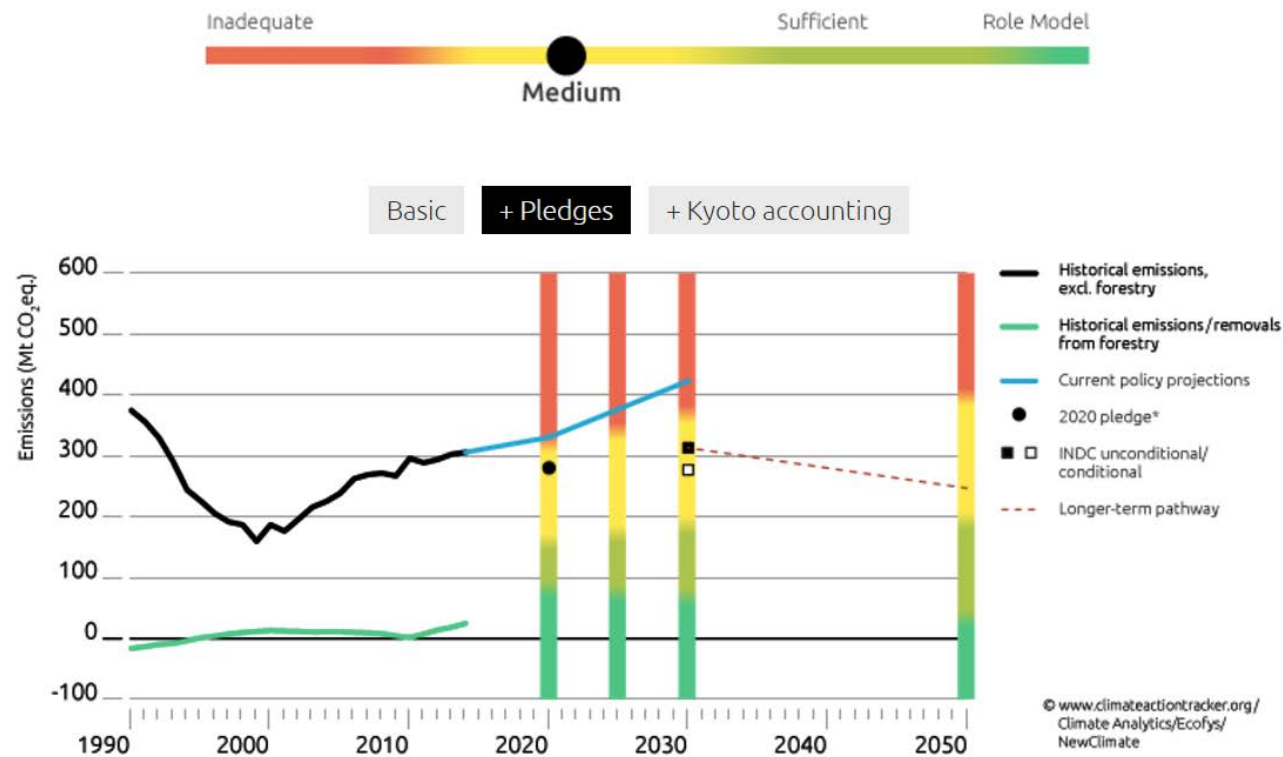


Note: Hover over the coloured bars for a pop-up with the fair emissions range per effort sharing category. More information [here](#).

\* Emissions level in 2020 resulting from conditional/unconditional pledge. This differs from the Kyoto pathways as it depicts final 2020 levels whereas the Kyoto emissions allowances consider the average level of emissions over the second commitment period (2013-2020).

- Unconditional 15% reduction by 2030 (25% conditional on support)
- Climate Action Tracker considered it “medium”:
  - “Least ambitious end of what would be a fair contribution”.

# Proposed 2050 target of 25% reduction below 1992



Note: Hover over the coloured bars for a pop-up with the fair emissions range per effort sharing category. More information [here](#).

\* Emissions level in 2020 resulting from conditional/unconditional pledge. This differs from the Kyoto pathways as it depicts final 2020 levels whereas the Kyoto emissions allowances consider the average level of emissions over the second commitment period (2013-2020).

- External assessment: “Current implemented policies are not yet sufficient to meet its targets”.
- Emissions would increase 13% by 2030 above 1990 levels.

The energy  
investment  
needs of CAREC  
countries are  
around \$170  
billion dollar

**Much of it needs to be in renewable energy**

- Multinational financial institutions can help...
- ...but governmental funds will be insufficient
- Governments will support to mobilize funds...
- ....and understand mega-trends in clean tech

# A “carbon bubble”: investors in fossil fuels can no longer ignore climate risks

Climate  
change as  
investment  
risk.

- A 2016 Report by BlackRock, world’s largest asset manager with ~ \$5tn in assets, issued a report recommends investors to include climate risks in their decisions.

Financial  
industry  
standards to  
disclose  
climate risks

- New York’s Sustainability Accounting Standards Board (SASB) which measures \$27.5tn (93% of US stocks)



# Diversification and decarbonization strategies are related goals

**Low diversification is risk to long term growth...**

- Lack of economic diversification
- Volatile commodity markets
- Low oil prices

**... which calls for new strategies to diversify exports and energy sources**

- integrate renewable energy, energy efficiency to help diversify from fossil fuel dependency

**Energy assets are approaching the end of a cycle...**

- Over 60% of power generation assets are over 30 years old, and generation and transmission will require investments of \$33 billion by 2022. (Carec Strategy)

**... call for investment strategy seeking alignment with energy mega trends**

Such as renewable energy prices, development of new energy technologies, and Paris commitments to reduce carbon pollution.

# Railroad investments as driver for cleaner, transportation and competitiveness

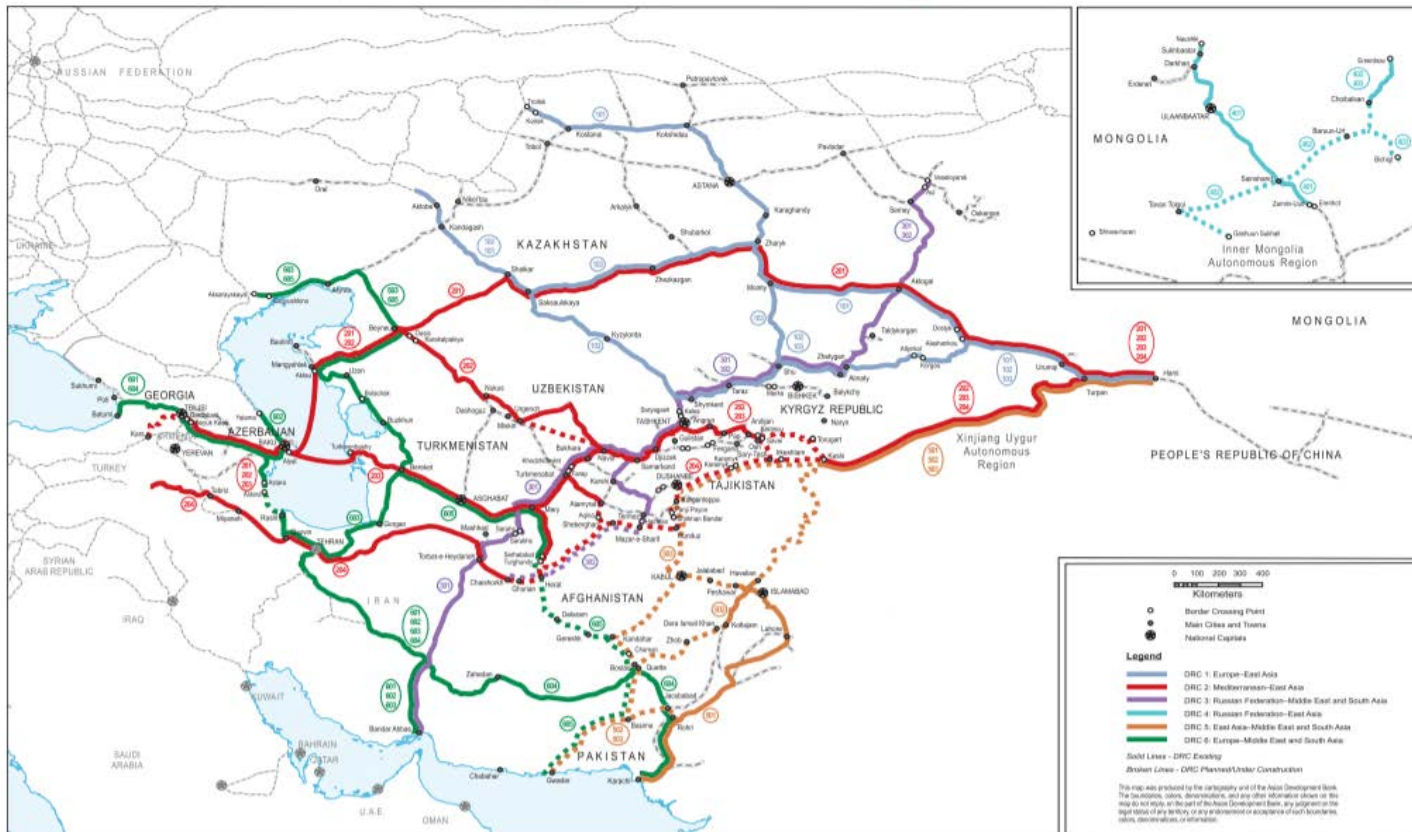
## **Good for the environment**

- The goal is to find inexpensive, efficient, safe, and environmentally sound modes of transport. (transport strategy)
- Energy security concerns, cost of and environmental problems with road transport, are making CERAC appreciate the role of railways.

## **Good for trade**

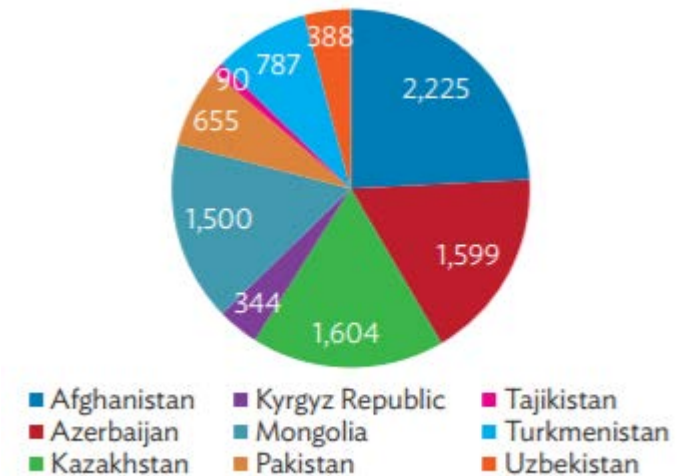
- Given that most CAREC are landlocked, a regional railway will help them go from landlocked to land-linked status.
- Ability of railways to move freight traffic at low cost and with a small environmental footprint will contribute to the expansion of trade in landlocked countries.

# \$38 billion needed to 2030 for core railroad network ( \$10 billion to 2020)



Source: CAREC Secretariat.

Distribution of Investments  
by Country, 2017–2020  
(\$ million)





# Making transport systems “Paris compatible”

## Electrification of the railroad...

Of the railway length (25,200 km),  
3,900 km (12%) are electrified

7,200 km to be constructed  
2,000 km will be electrified.

~

## ....can help reduce carbon emissions

- GHG per ton-km for a freight train are less than 30% of those of trucks
- Passenger train emissions per passenger-kilometer are less than 40% of those for passenger cars.

# Build strong synergies with the air-quality improvement efforts to modernize cities



# Decarbonization & Diversification

1. Design investment agenda to decarbonize the future

2. Risk management strategy against stranded assets

3. Economic assessment of impacts of coal on public health

4. Special task force to monitor electrification of transportation

5. Lessons from oil-intensive Norway Sovereign Wealth Fund's renewables strategy



1

**A transformation is underway**

The transition toward renewables and electric transportation is unstoppable. It has profound implications for infrastructure decisions.



2

**We can lead, not just follow**

Developing countries benefit from making cleaner, bolder choices. Our countries can be idea shapers, not just idea takers.



3

**CERAC countries can avoid others' mistakes**

By diversifying away from fossil fuels countries will reduce the risk of stranded assets.





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