Climate Policy & Economic Prosperity:

Can we have our cake and eat it too?

CHANGE AHEAD

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Calgary - June 18, 2018

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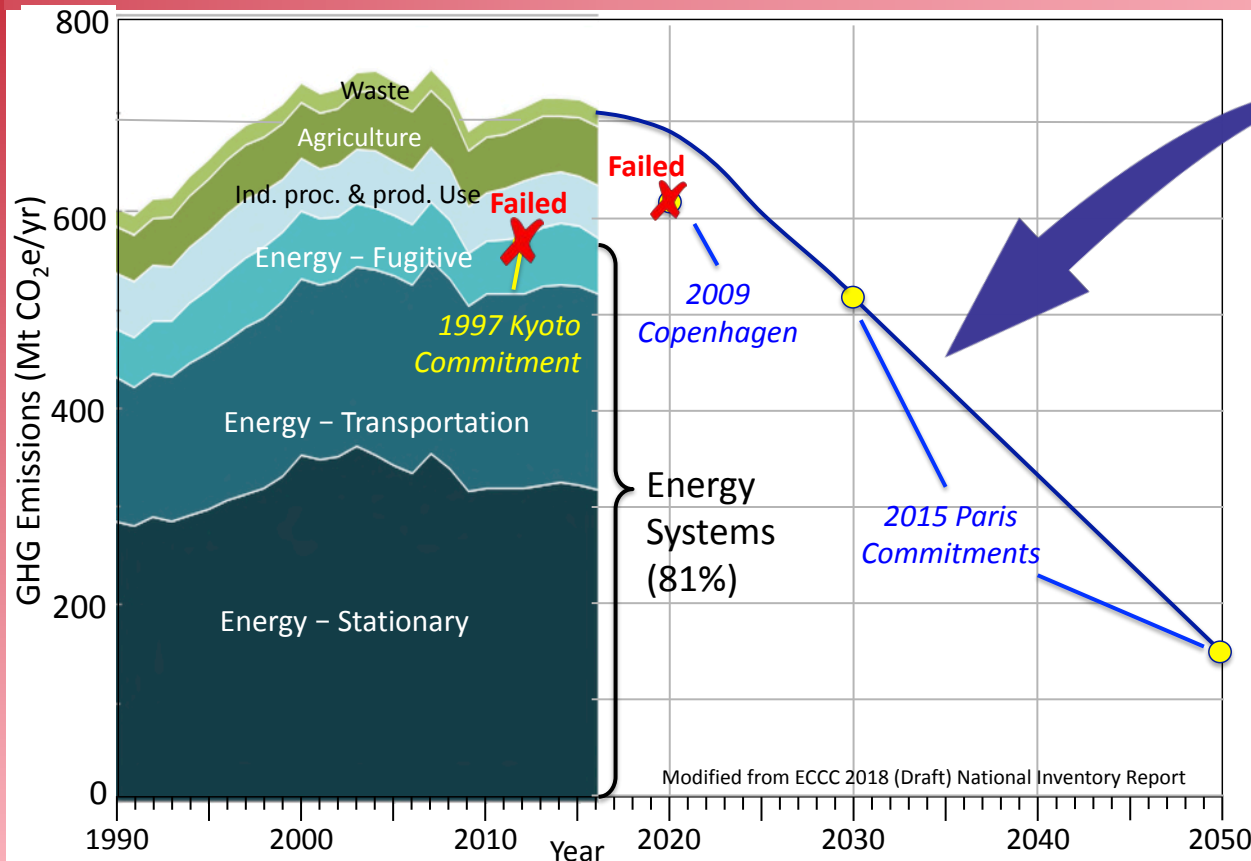
CRC IN GOVERNANCE FOR SUSTAINABLE DEVELOPMENT

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Canada's Climate Change Challenge

This requires **TRANSFORMATIVE - EVEN *DISRUPTIVE* - SYSTEMS CHANGE**

Canadians want to achieve this while:
- ✓ *Enhancing economic prosperity;*
- ✓ *Growing the Cdn population.*

How to Achieve Systems Change?

CURRENT CLIMATE POLICY TOOLS:

➢ Carbon Pricing

➢ Regulations

➢ Incentives

❑ Useful tools, but they are not capable of achieving the 2015 Paris targets;

WHY? ... For a significant proportion of the population, the climate change threat is **not a sufficiently compelling reason** to make transformative, systems-level changes.

We Live in a Time of Transformative / Disruptive Change
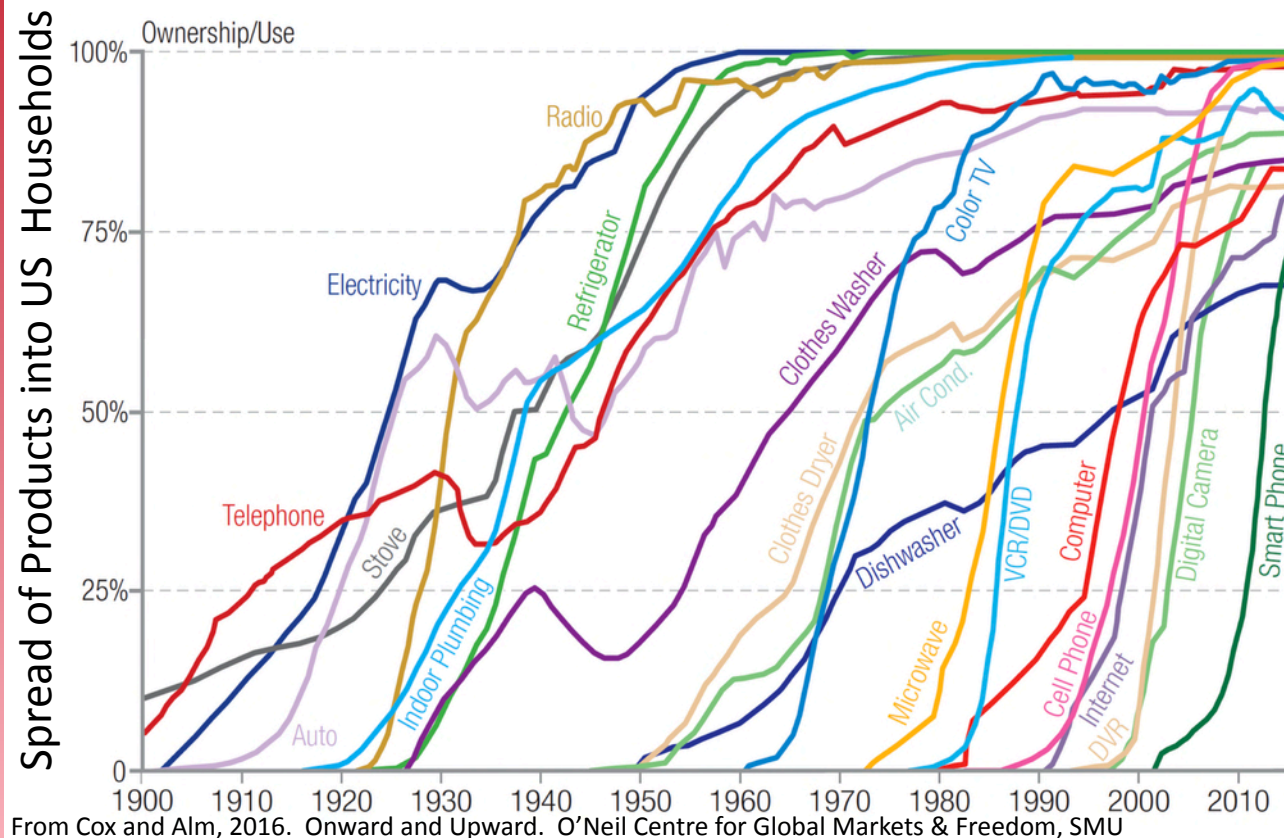
Not included here:

- ❑ Media   ❑ Movies
- ❑ Retail   ❑ Books
- ❑ Music   ❑ Banking
- ❑ Images / printing
- ❑ Telecommunications

How can the forces of transformative / disruptive change be harnessed to address societal objectives (including GHGs)?

From Cox and Alm, 2016. Onward and Upward. O'Neil Centre for Global Markets & Freedom, SMU

Outline

1. **The Transitions Pathways Initiative:**

   ➢ *Directing Disruption*: A new evidence-based approach to climate policy making

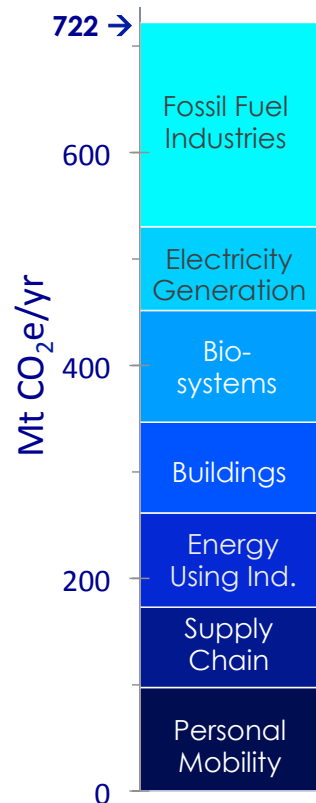2. **Transportation as an Example**

3. **Conclusions**

4. **Discussion**

The Transitions Pathways Initiative

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Canada's 2015 GHG Emissions

Mt CO_2e/yr

722 →

Fossil Fuel Industries	
Electricity Generation	
Bio-systems	
Buildings	
Energy Using Ind.	
Supply Chain	
Personal Mobility	

600

400

200

0

- *What works?*
- *What doesn't?*
- *Why?*

…for how disruptive innovations could best address the 'problems'

How to get 'there' from 'here'?

EXPERT & STAKEHOLDER INTERACTION

Data → **Problems**

Problems → **Vision**

Vision → **Pathways**

Data → **Disruptors**
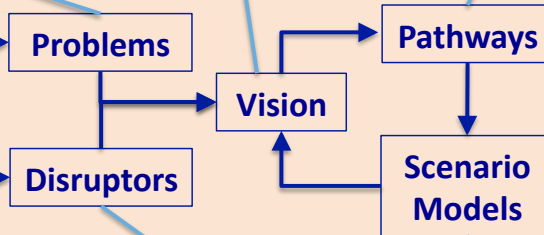
Pathways → **Scenario Models**

Vision ↔ **Scenario Models**

Compile & assess data on:
- *flows of energy & materials;*
- *GHGs,*
- *Socio-economics;*
- *Demand drivers;*
- *Etc …*

Identify technology, business model & social innovations capable of addressing problems.

Model the proposed Pathway(s) to ensure they are 'Credible, Compelling & Capable'

Defining Pathways

EXISTING SYSTEM → **PATHWAY** → NEW SYSTEM
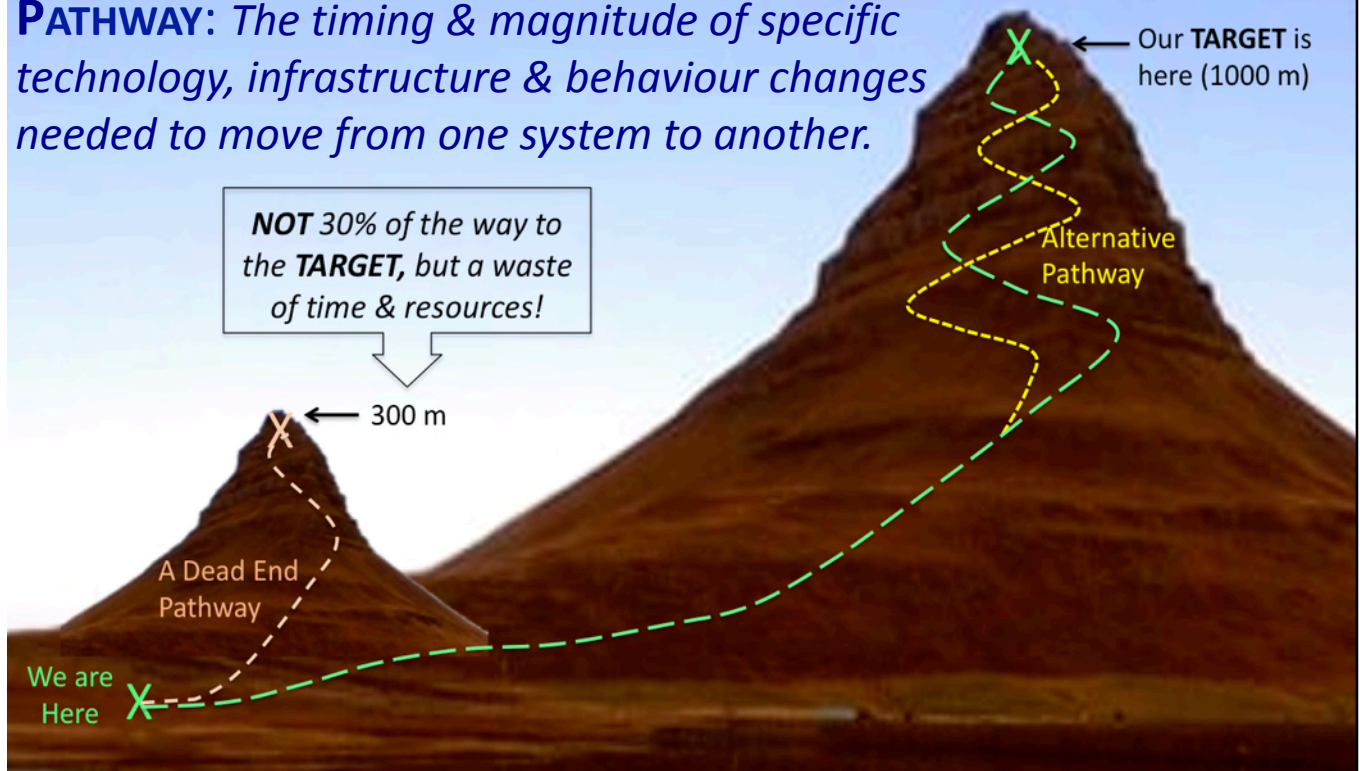
PATHWAYS must be:

1. CREDIBLE
- ❑ Technically, economically, socially

2. COMPELLING
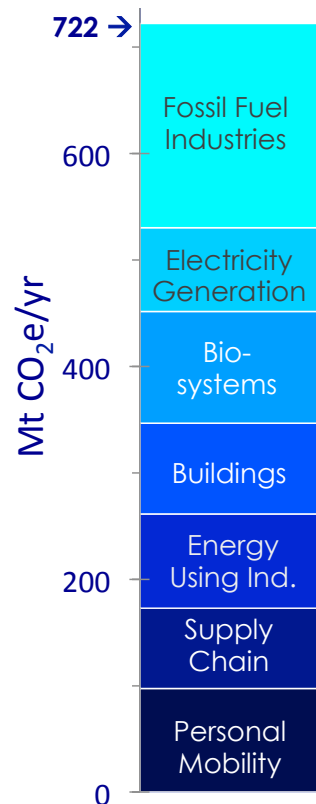- ❑ Desirable by key stakeholders

3. CAPABLE of achieving the target.

PATHWAY: *The timing & magnitude of specific technology, infrastructure & behaviour changes needed to move from one system to another.*

NOT 30% of the way to the **TARGET**, but a waste of time & resources!

← 300 m

Our **TARGET** is here (1000 m)

Alternative Pathway

A Dead End Pathway

We are Here X

Kirkjufel Mountain (Iceland) in two sizes. Modified from https://www.west.is/static/toy/images/Place_308_3___Selected.jpg

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Fossil Fuel Industries
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- *What works?*
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EXPERT & STAKEHOLDER INTERACTION

Data

Problems

Disruptors

Vision

Pathways

Scenario Models

Intervene in societal debate (reports, briefings, convening, media)

Identify innovation priorities

Advice to Decision Makers

Spin out Consortia (ideally industry led)

Products

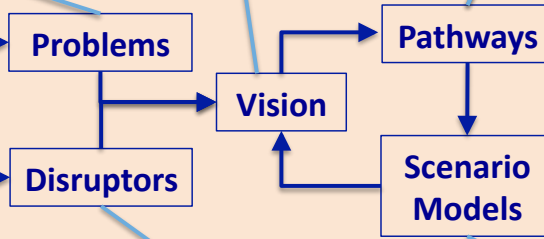*Compile & assess data on:*
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Model the proposed Pathway(s) to ensure they are 'Credible, Compelling & Capable'

"We cannot predict the future, but we can invent it."
Dennis Gabor, Nobel Prize (Physics) (1971)

The Transitions Pathways Initiative

Instead of focusing narrowly on:

Climate Change…
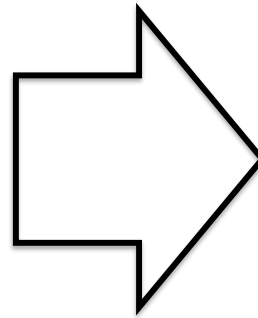
Expand the scope to address:

Systems Change…

*… Policy and investment decisions can be used to encourage, discourage, nudge or otherwise **'direct disruptive forces'** to achieve societal objectives:*

- ❏ *GHG reductions*
- ❏ *Economic Prosperity*
- ❏ *Improved health outcomes*
- ❏ *Quality of Life*
- ❏ *…*

Outline

1. ***The Transitions Pathways Initiative:***

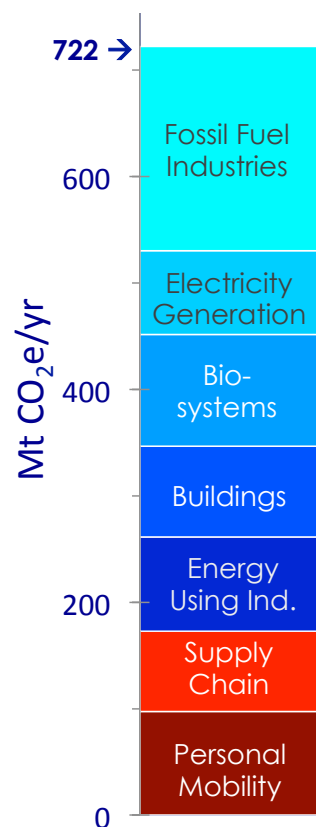   ➢ *Directing Disruption*: A new evidence-based approach to climate policy making

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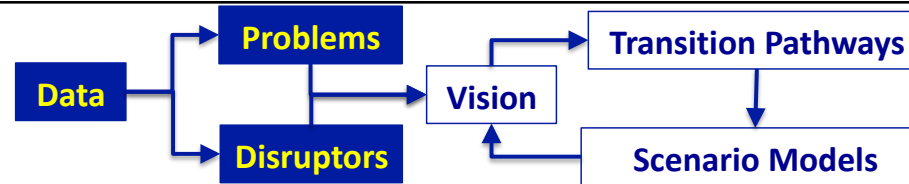
Transportation as an Example

Canada's 2015 GHG Emissions

Mt CO_2e/yr

722 →	
	Fossil Fuel Industries
600	
	Electricity Generation
400	Bio-systems
	Buildings
200	Energy Using Ind.
	Supply Chain
	Personal Mobility
0	

Transportation is the critical 'Linchpin' in Canada's GHG management strategy:

WHY?

❑ ~24% of Canada's GHG emissions;

❑ Creates demand for oil:

  ❖ Contributes another ~23% of Cdn GHGs (incl. exports);

  ❖ Transportation fuels = 73% of each barrel of oil;

  ❖ Alberta oil provides fuels equivalent to 9X AB demand.

❑ Defines urban form (esp. Sprawl);

❑ 100+ year old ecosystem poised for disruptive change.

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Data → Problems → Vision
Data → Disruptors → Vision
Vision → Transition Pathways → Scenario Models
Disruptors → Scenario Models

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PROBLEMS IN TRANSPORTATION

ALL
- ❑ Accidents (est. @ $62B/yr in 2007)
- ❑ Congestion (~4700 per-yrs lost/wk day)
- ❑ Air pollution (est. @ $36B/yr in 2007)
- ❑ GHG Emissions (WtW ~225 Mt CO_2 e/yr)

PERSONAL MOBILITY
- ❑ Value for money (pers LDV cost $13.8K/ AB family/yr, but used only ~4% of time)
- ❑ Parking (4+ spaces/veh , est. $46B/yr)
- ❑ Urban Sprawl

FREIGHT
- ❑ Labour shortage/costs (i.e. truck drivers)
- ❑ Load factor/truck use rate
- ❑ Maintenance/operational costs
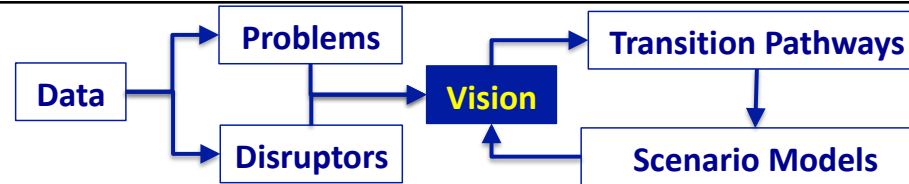
DISRUPTIVE INNOVATIONS

TECHNOLOGIES
- ❑ Autonomous vehicles
- ❑ Car sharing
- ❑ Electric vehicles
- ❑ Big data / Digital connectivity
- ❑ Faster / cheaper computers
- ❑ AI / robotics / drones

BUSINESS MODELS
- ❑ Mobility as a Service
- ❑ Physical Internet
- ❑ Consolidation of carriers

SOCIAL
- ❑ Generational values
- ❑ Environmental concerns
- ❑ Government policies

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PERSONAL MOBILITY
- Value for money (avg LDV costs ~$13.8K/ AB family/yr, but used only 5% of time)
- Parking (4+ spaces/veh., est. ~$16B/yr)
- Urban Sprawl

FREIGHT
- Labour Shortage (~truck drivers)
- Load factor/Truck use rate
- Maintenance/Operational costs

DISRUPTIVE INNOVATIONS

TECHNOLOGIES
- Autonomous vehicles
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Building Visions for Credible, Compelling & Capable Pathways

- Many possible pathways that – if deployed strategically – should be able to mitigate climate change, improve health outcomes and enhance economic prosperity;
- Ideally, the more promising visions will be backed by companies, environmental groups, foundations, investors & governments.
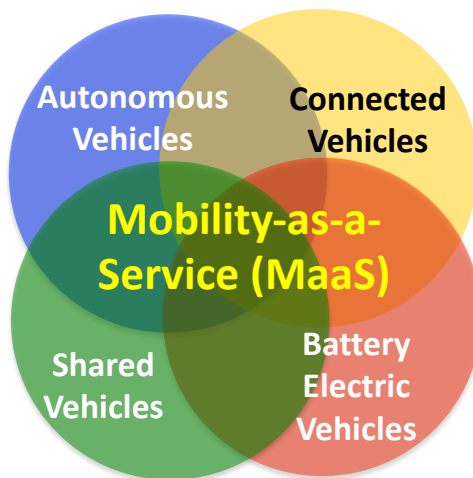
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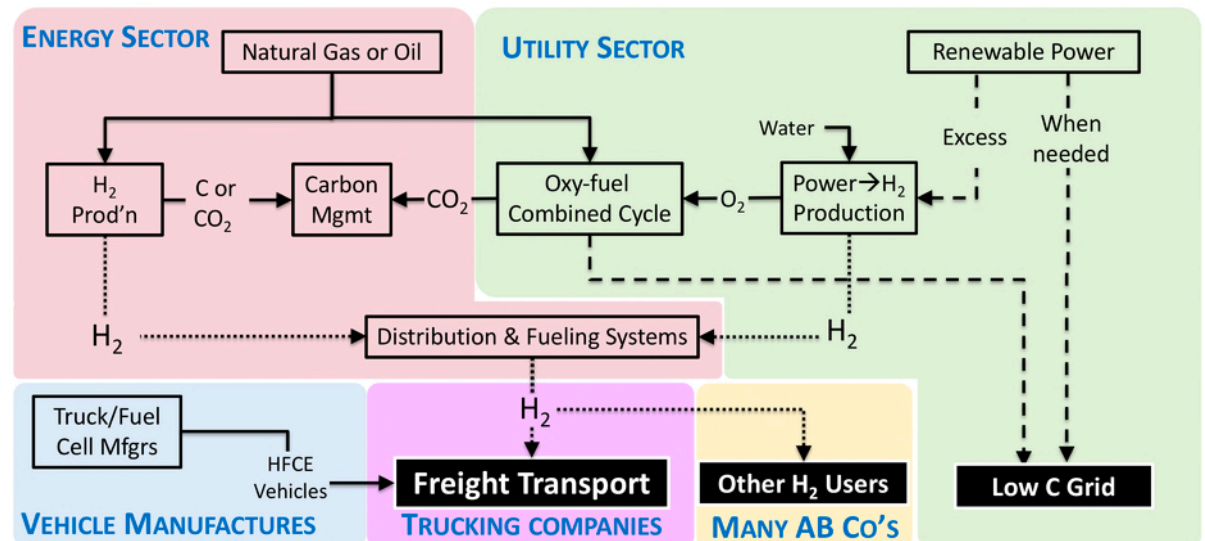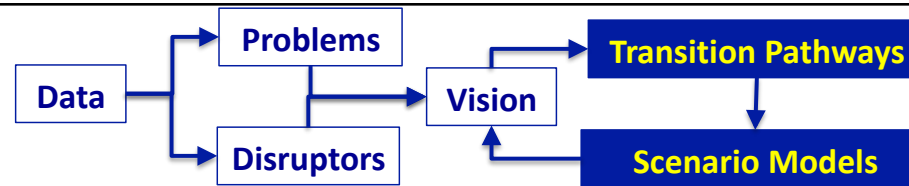
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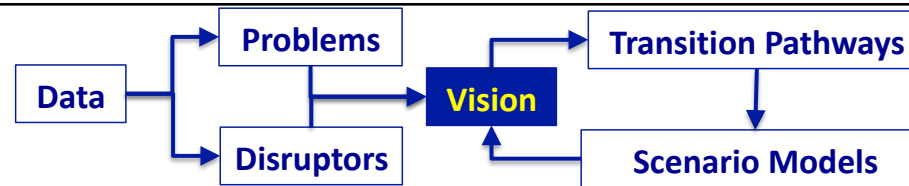
A high level view of CESAR's visions for transforming transportation in a way that enhances economic prosperity while addressing climate change:

Personal Mobility

- Autonomous Vehicles
- Connected Vehicles
- **Mobility-as-a-Service (MaaS)**
- Shared Vehicles
- Battery Electric Vehicles

Freight Transport & the Electrical Grid

ENERGY SECTOR

Natural Gas or Oil → H_2 Prod'n → C or CO_2 → Carbon Mgmt → CO_2 → Oxy-fuel Combined Cycle

UTILITY SECTOR

Renewable Power

Water → Power→H_2 Production ← O_2 ← Oxy-fuel Combined Cycle

Excess / When needed

H_2 → Distribution & Fueling Systems ← H_2

VEHICLE MANUFACTURES

Truck/Fuel Cell Mfgrs → HFCE Vehicles → **Freight Transport**

TRUCKING COMPANIES

H_2 → Freight Transport

Other H_2 Users — **MANY AB CO's**

Low C Grid

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Km Travelled

Billion km/yr

BAU Scenario

Intercity

ESAC Vehicles

Non-commuter

PLD Vehicles

Commuter

 # Vehicles

Millions Vehicles

BAU Scenario

1 ESAC replaces 6 PLD vehicles

PLD Vehicles

ESAC Vehicles

Lifecycle GHG Emissions

Mt CO$_2$e / Year

BAU Scenario

Combustion

PLD Vehicles

ESAC Upstream electricity

Upstream oil

Oil Demand

M bbl Oil / day

BAU Scenario

Mobility -as-a- Service
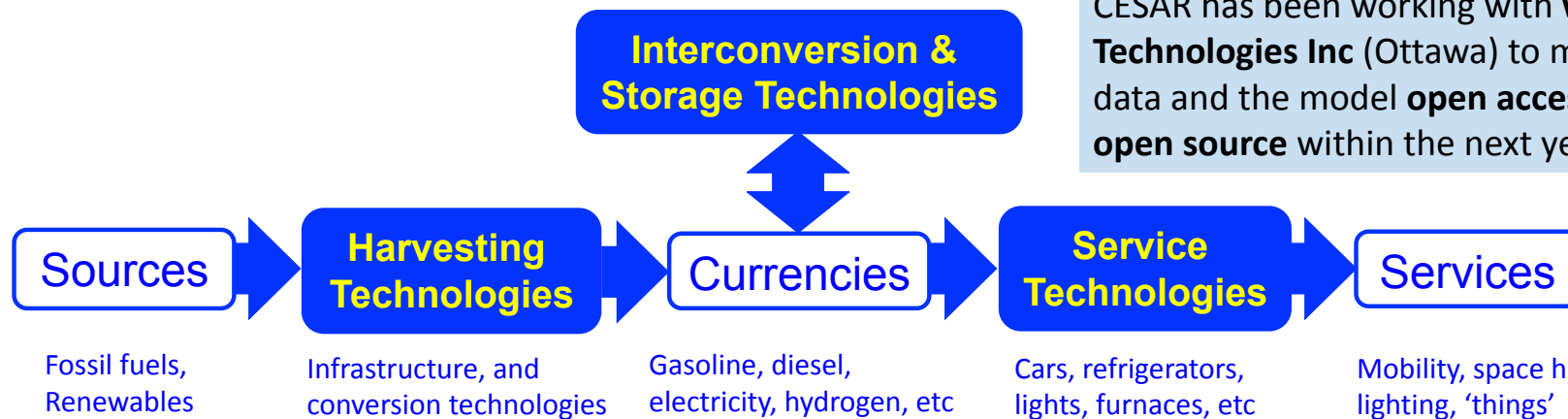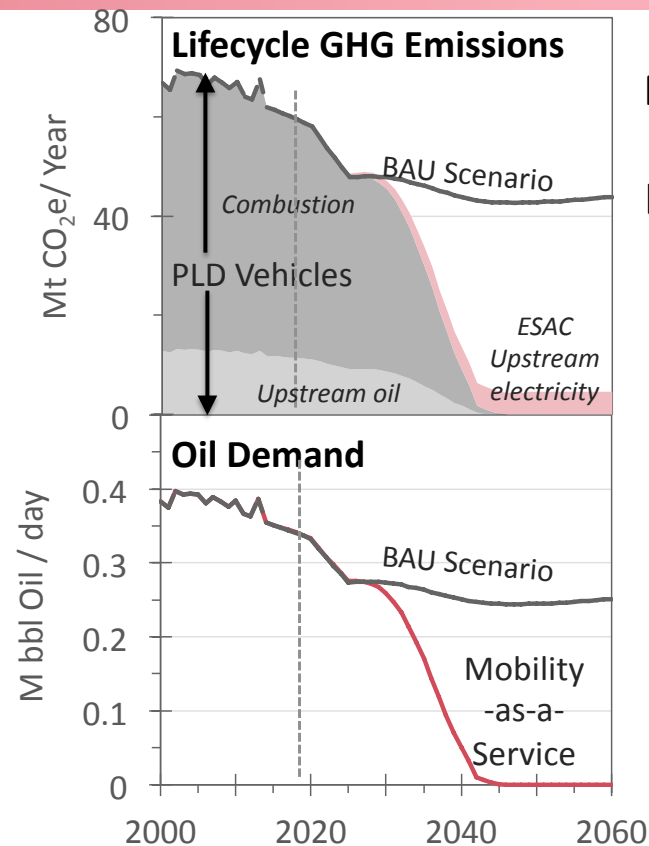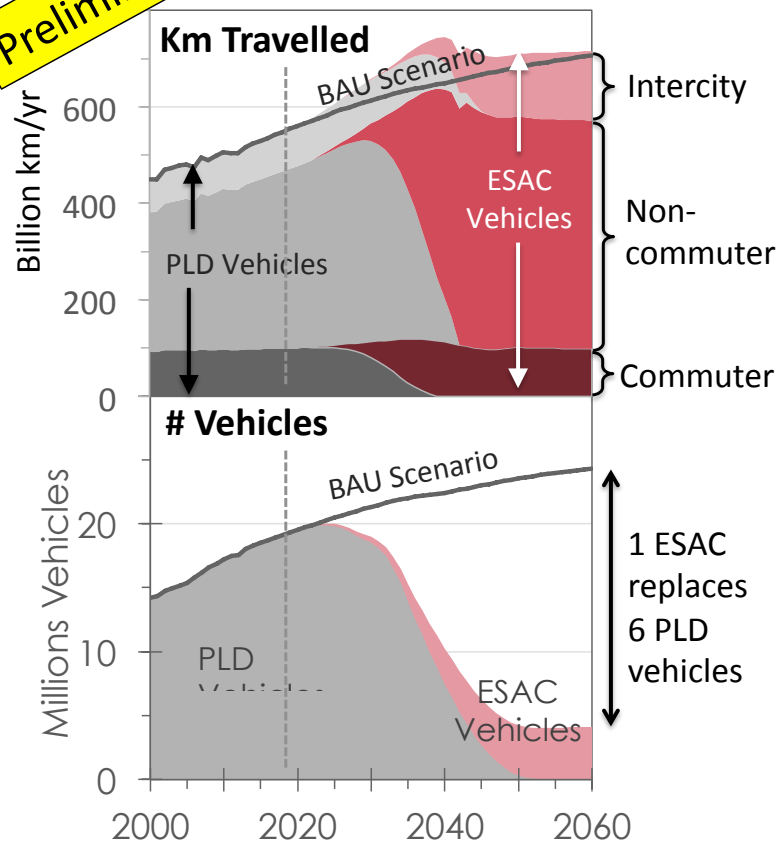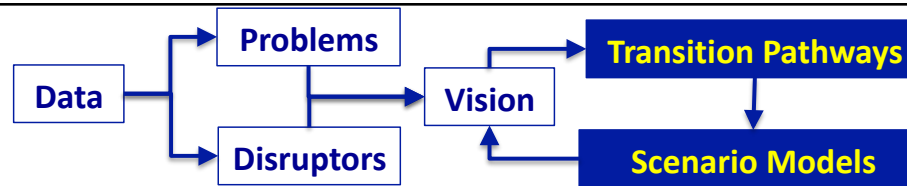
Note:

❑ This Scenario run was able to achieve a ~90% reduction in 2005 levels of GHG emissions by 2050.

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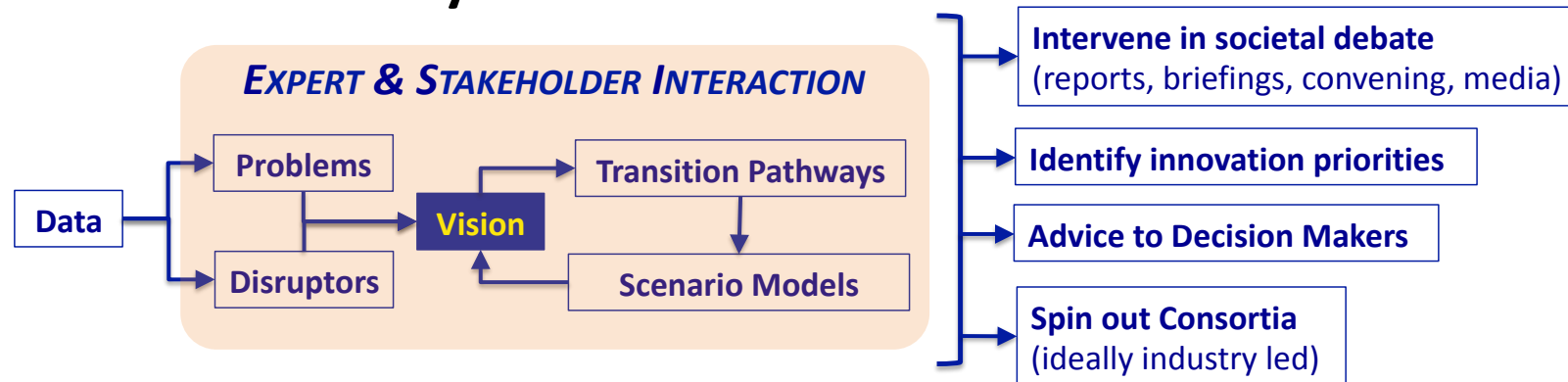
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Conclusions

WHY BUILD TRANSITION PATHWAYS FOCUSED ON SYSTEMS CHANGE?

1. **Expands the tools** that can be used to support / manage the kind of transformative / disruptive changes needed to address societal goals;

2. Potential to identify **credible, compelling pathways that are capable** of meeting societal goals (including, but are not limited to, GHG management);

3. Provides government/industry with **metrics** to measure progress towards goal;

4. Avoid investments in **'dead-end' pathways**;

5. Contributes to the **Innovation agenda;**

6. Hopefully, **elevate the climate change discussion** above the political level (to an emerging consensus on positive systems change, rather than 'C taxes' and 'pipelines');

Discussion

Transitions Pathways Initiative

EXPERT & STAKEHOLDER INTERACTION

Data → Problems / Disruptors → Vision → Transition Pathways → Scenario Models

- Intervene in societal debate (reports, briefings, convening, media)
- Identify innovation priorities
- Advice to Decision Makers
- Spin out Consortia (ideally industry led)

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