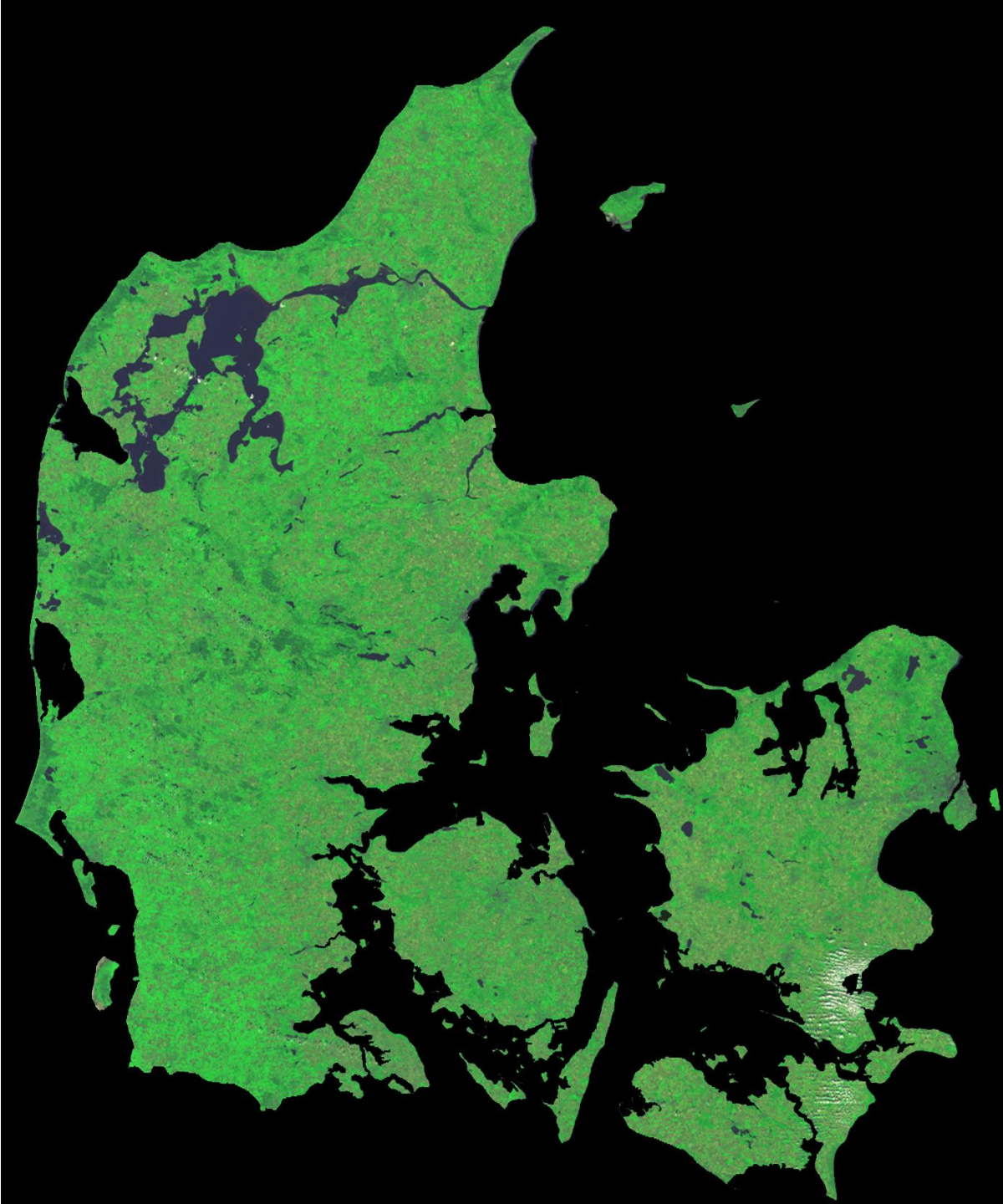


Denmark as a Testbed for the Green Transition

Dr. Christian H. M. Ketels
Institute for Strategy and Competitiveness, Harvard Business School

*Copenhagen, Denmark
September 2020*



-70%

CO2 emissions vs 1990

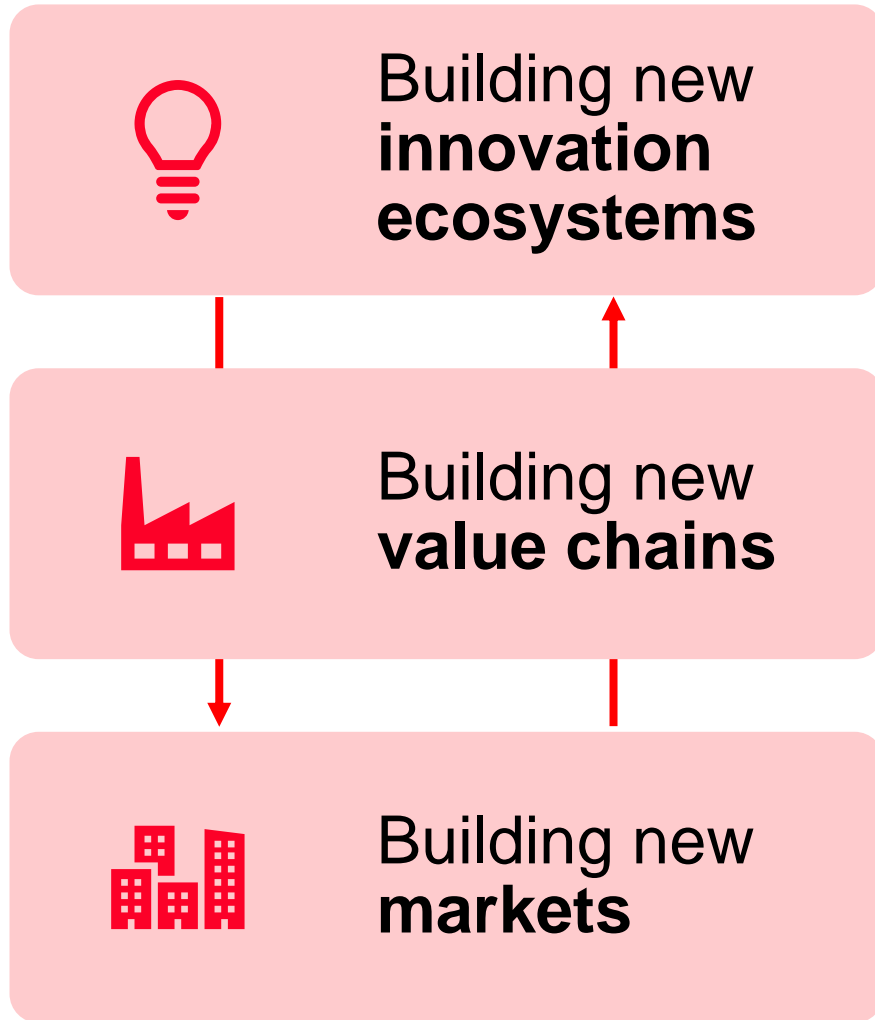
2030

-100%

CO2 emissions vs 1990

2050

What Does it Take?



- Many institutions, organizations, and individuals will have to change their behavior and act in a coordinated way
- Many policy interventions and public as well as private investments will have to be made in a concerted way

Solutions ... Firms

Skills ... Ideas



A photograph of a desert landscape with a road leading towards mountains. A green highway sign is visible on the right side of the road.

Stovepipe Wells	28
Death Valley Museum	53
Death Valley Jct (127)	83

EAST

CALIFORNIA
190



From Academic Excellence to Economic Success: The Massachusetts Life Sciences Initiative



**75,000 Employees
(+20,000 in 10y)**

\$12bn total payroll

**Top pharma firms
present**

**VC investment up
8x since 2010**

**18 IPOs in 2018,
31% of US total**

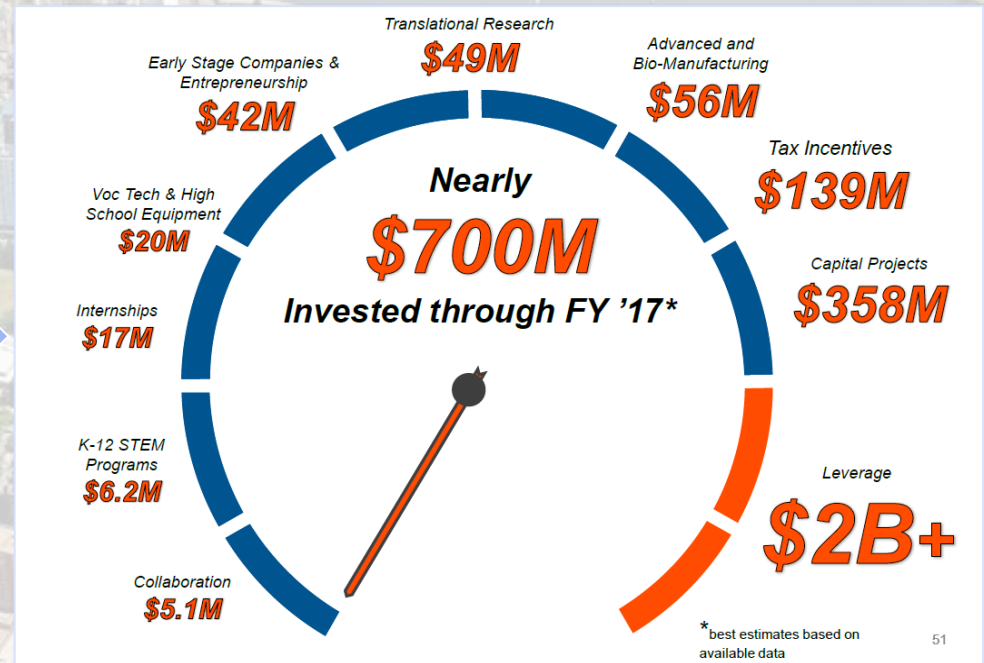
Assets

Action

Impact

From Academic Excellence to Economic Success: Labs and Testing Facility within a Broad Agenda

- Diagnostics
- Strategic choice
- Integrated action plan
- Governance



Source: Susan Windham-Bannister

Scaling the Impact of Science and Skills: e-Estonia



e-Estonia at a glance



98% of the population has an ID-card



99% of state services are online



95% of tax declarations filed online



5 days and 2% of GDP per year is saved with digital signatures



98% of companies established online



Entire country is covered with a broadband connection



99% of banking done online



e-Residency – Freedom for everyone to run a global EU company fully online



NATO Cooperative Cyber Defence
Centre of Excellence

The Reality of the Danish Innovation System



- Many strengths, including strong skill base and deep research system
- No sufficiently clear **strategic direction** domestically and positioning globally
- **Fragmentation** across the system, with efforts to reduce the need for coordination, rather than enabling it
- Many reforms, but focus on **efficiency** of individual parts, not systemic effectiveness

Turning the Green Transition into a Step Change for the Danish Innovation System



- CO2 target signals **what Denmark wants to achieve**, but not yet how it will enable progress to get there
- **Climate partnerships** are a start in overcoming fragmentation; other changes in the innovation system point in the same direction
- The **detailed individual actions** now need to be defined, as well as their alignment and interactions to achieve the systemic change needed



**Is it helpful to think
about the
Green Transition as a
'Moonshot' Mission?**

Implications for Testbeds and -facilities

- Testbeds and –facilities are **important and often necessary** elements on the path from new scientific insights to sustainable market solutions at scale
- Investments in testbeds and – facilities need to be **embedded and driven by broader strategies and ecosystems/clusters**
- **Operational details** (business model, interface with users, specific facilities offered) are as important as the right strategic ambition

Technology Readiness Levels (TRL)

TRL9 **Operations**

TRL8 **Active Commissioning**

TRL7 **Inactive Commissioning**

TRL6 **Large Scale**

TRL5 **Pilot Scale**

TRL4 **Bench Scale Research**

TRL3 **Proof of Concept**

TRL2 **Invention and Research**

TRL1 **Basic principles**

