Introduction to Sustainable Transportation

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University of Washington

Why Does Sustainability Matter?

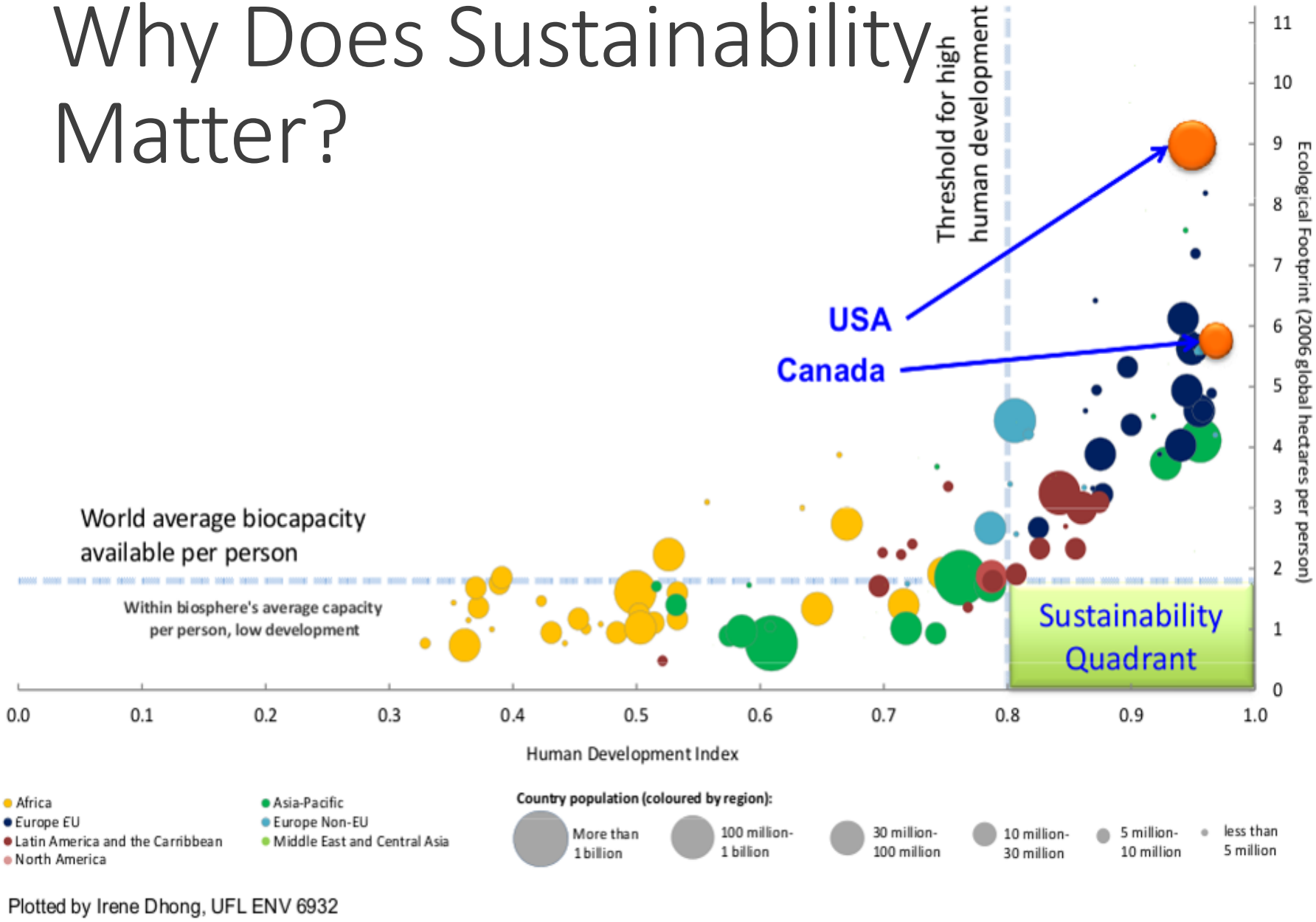
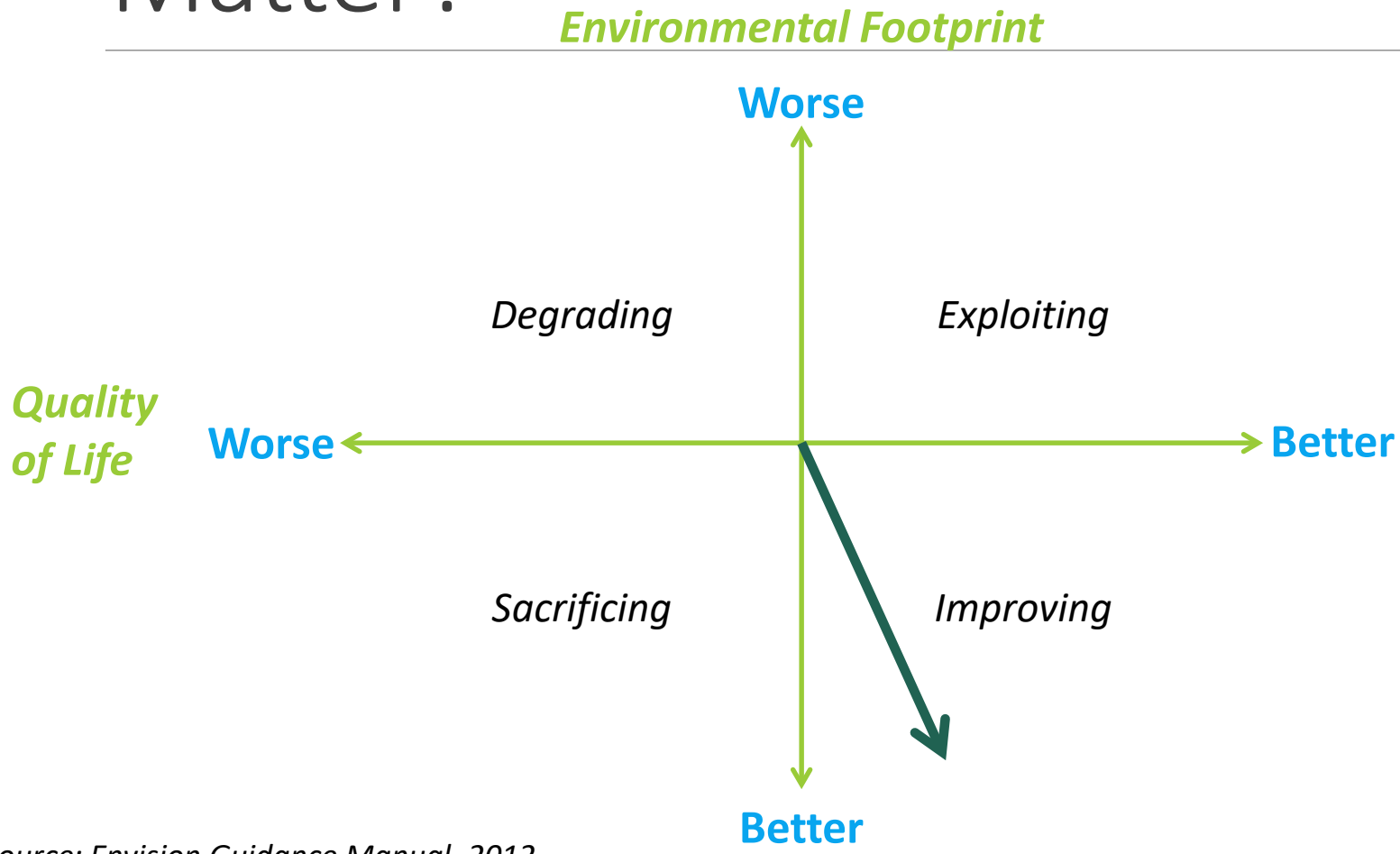


Figure 6: Human development index vs. ecological footprint by country (Source: Living Planet Report 2006, World Wildlife Fund).

Why Does Sustainability Matter?



Source: Envision Guidance Manual, 2012

Why Sustainable Transport?

Transport accounts for much of our:

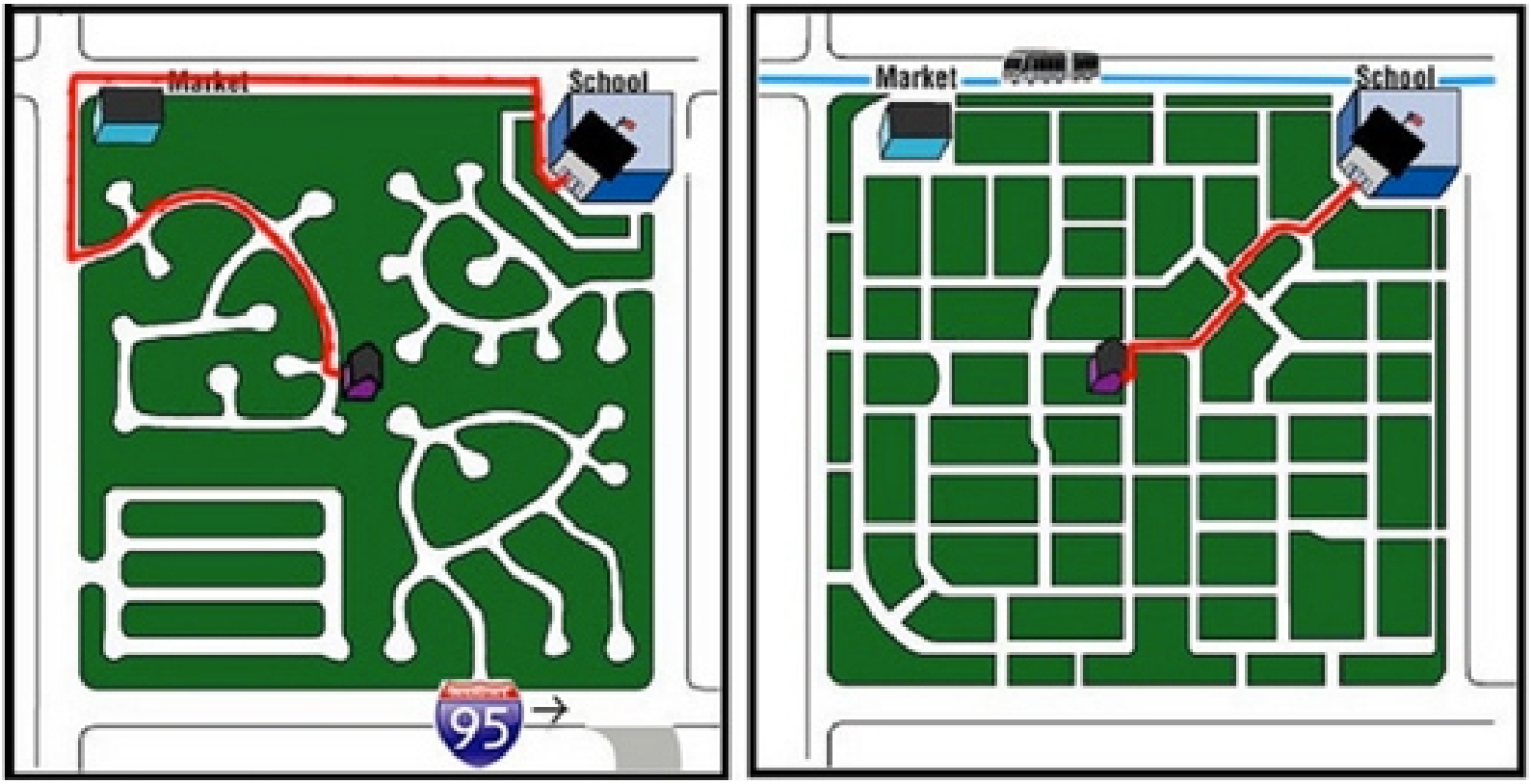
- Energy Use
- Carbon Emissions

Urbanization is continuing worldwide:

- Increased density is an opportunity
- Provides economies of scale

Image: Beijing Traffic (abc.net.au)

How Do We Get There?



Source: Utah Street Connectivity Study

Patterns of Development

TRADITIONAL SUBURBAN RESIDENTIAL

Source: iStockphoto/Scott Cramer

TRANSIT-ORIENTED DEVELOPMENT

Source: thetransitpass.wordpress.com

What Can We Do?

Change how we plan, design, build, and live:

- Consider life-cycle costs and effects
- New focus on livability, especially for land use and development
- Alternative energy sources
- Don’t forget freight/goods movement

Planning is Already Changing

Complete Streets

Walk/Bike Emphasis

Demand Management

Pricing/Tolling

Transit-Oriented Development

Focus on Resiliency

Photo: http://www.connectnorwalk.com/

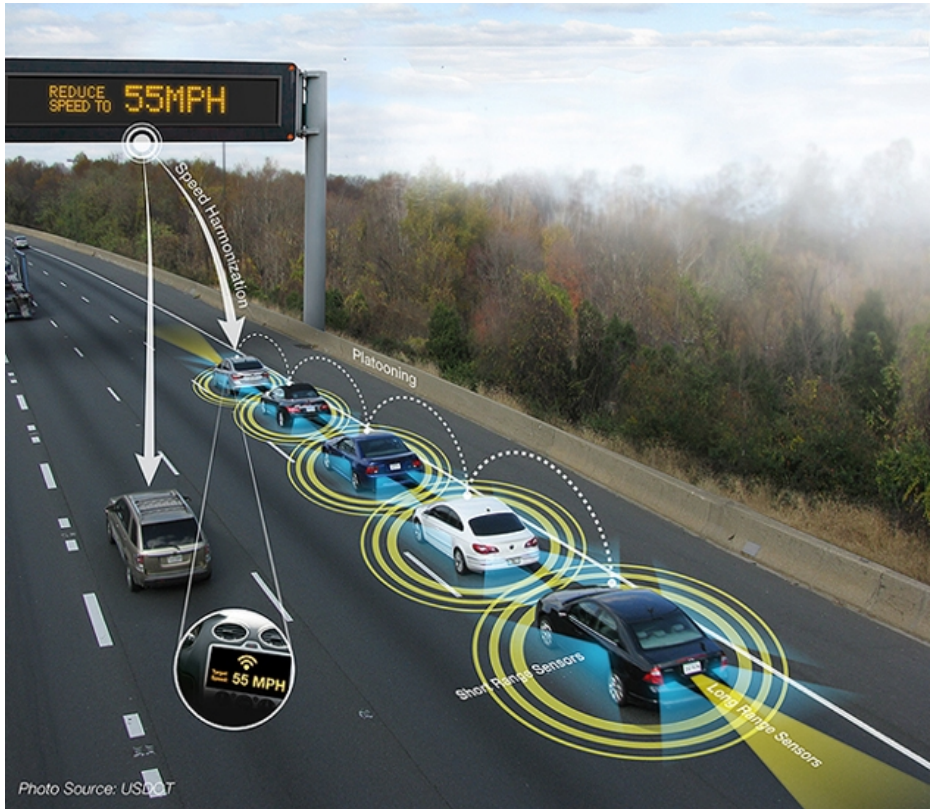
Can Technology Save Us?

Connected/
Autonomous vehicles?

Hyperloop?

Air Scrubbers?

Transporters?



Thank You!

Masdar City, Abu Dhabi, United Arab Emirates

APA Webinar

Sustainable Transportation - What is it? With Examples from a Sustainability Icon, Norway!

August 17, 2018

UNIVERSITY of WASHINGTON

Agenda

- Introductions
- Why sustainable transportation?
- About the University of Washington Program
- Overview of Sustainable Transportation (Ryan)
- Norway and Sustainable Transportation (Ed)
- Questions

Your presenters

Dr. Ed McCormack

- Director, UW's Master in Sustainable Transportation Program
- Research Associate Professor, UW Civil & Environmental Engineering
- Former Senior Engineer for Norwegian Public Roads Administration
- PhD: Geography

Dr. Ryan P. Avery, PE, AICP, GISP

- Senior Transportation Planner / Engineer at WSP
- Affiliate Professor, UW Civil & Environmental Engineering
- PhD: Civil & Environmental Engineering

Why Sustainable Transportation?

Why do we have a program in sustainable transportation?

New / major considerations:

> Climate change
> Human health
> Energy and resources
> Mobility and social equity
> Economy and e-commerce
> etc...

Opportunities for change:

> Non-motorized modes
> Travel demand management
> Tolls and pricing
> Public transit
> Autonomous vehicles
> Land use, transit-oriented development
> etc...

Early pricing example

University of Washington's Master of Sustainable Transportation (MST)

Focus on sustainable transportation:

> Planning, policy, research, and analysis

Explores the growing concern of transportation impacts across all categories:

> Environmental, social, energy, and economic impacts

Designed for working professionals:

> Convenient, part-time, online format with 43 credits

> 9 courses in three Focus Areas over 3 years

> MST Program website:

www.sustainable-transportation.uw.edu/

Norway and Sustainable Transportation

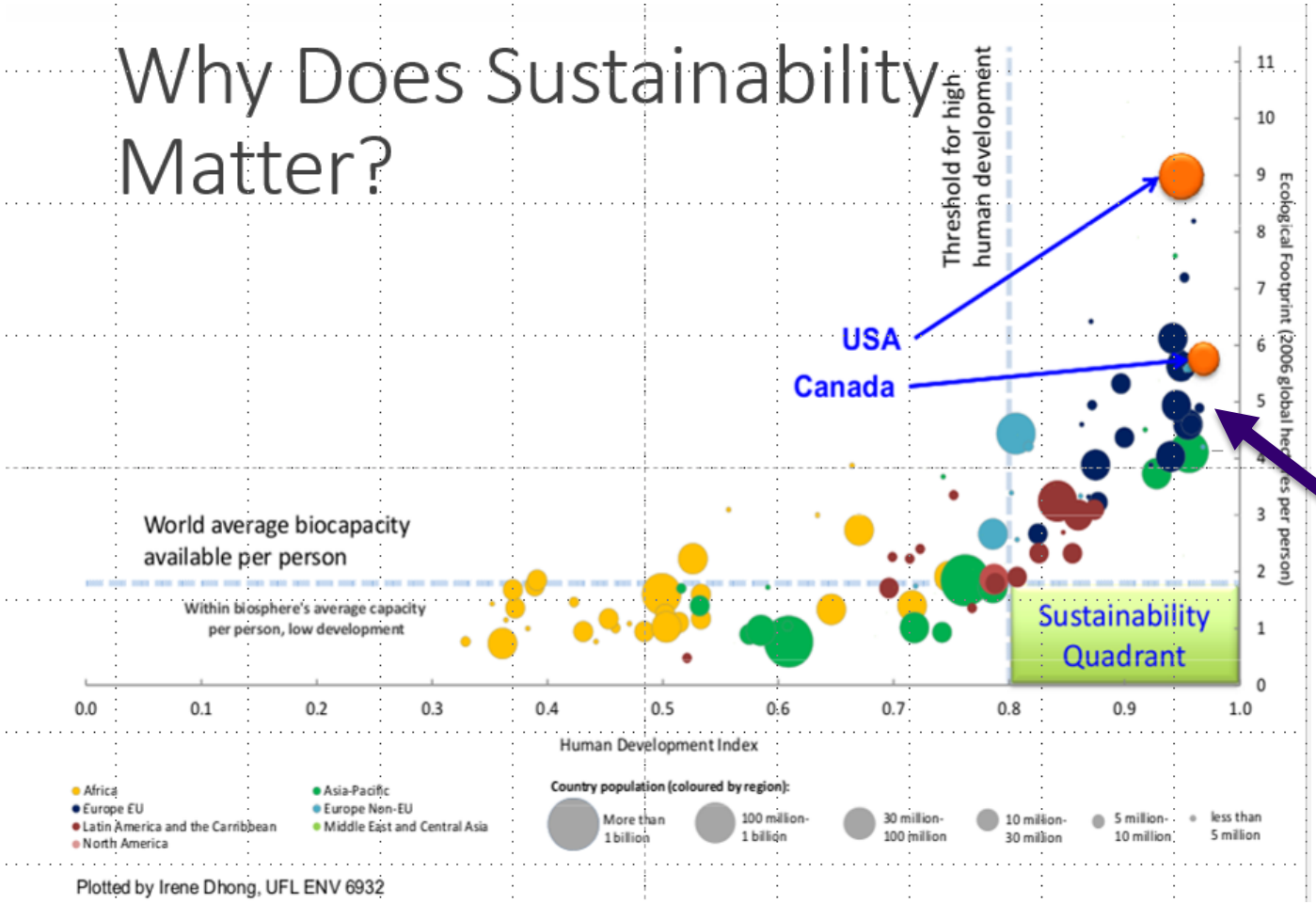
We will:

- Discuss why Norway is a sustainability transportation icon
- Present a few examples
- Look at Norway's programs and attitudes
- Speculate on why they value sustainability

Norway Overview

- High per-capita income (# 5 in world, US is # 9)
- Major oil exporter
- Income evenly distributed (Gini index)
- Social welfare democracy
- Often in the top ranks in happiness surveys
- Not officially part of the Europe Union

Sustainability



Norway:
Ranked 1 in Human Development

Norway Facts

- Population 5.2 million (Minnesota)
- 125,000 square miles (New Mexico)
- 57,000 roadway miles (Wyoming)
- Density 34 people /sq. mile (Nevada)
- 16,000 miles of coast line
- Rugged, mountainous, arctic country
- Transportation budget around $7 billion (2017)

Challenges to Transportation -Mountains

Challenges to Transportation - Winter

Challenges to Transportation – Historic Urban Form

Norway as a Green Place

- Stated national goals:
  - all new vehicles are zero emission by 2025
  - zero passenger car growth in cities
  - carbon neutral by 2030 (partially by buying carbon offsets)
- Higher environmental impacts due to an advanced society
- But environmental policies well integrated
- Stable GHG even though transport volumes have increased
- 99% power from hydroelectric


Environment › Climate Change

Norway to 'completely ban petrol powered cars by 2025'

'What an amazingly awesome country', Elon Musk tweeted in response to the plan

Supports Alternatives to Fossil Fuel Vehicles

- Electric Cars: 52% of all new cars sales in 2017, 2nd largest Tesla

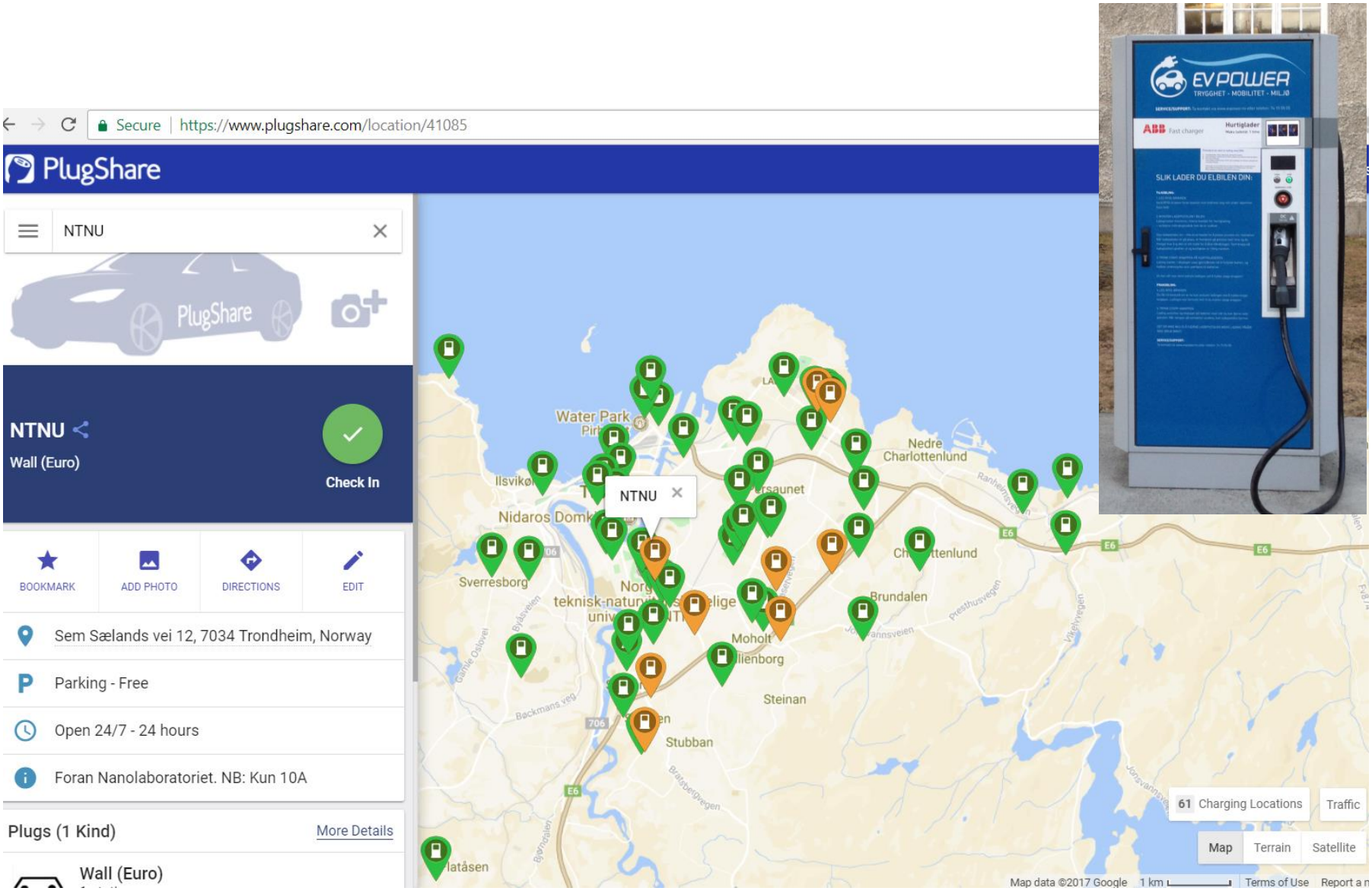
BUSINESS NEWS JANUARY 3, 2018 / 12:12 PM / 7 MONTHS AGO

Norway powers ahead (electrically): over half new car sales now electric or hybrid

Why are Electric Vehicles Common?

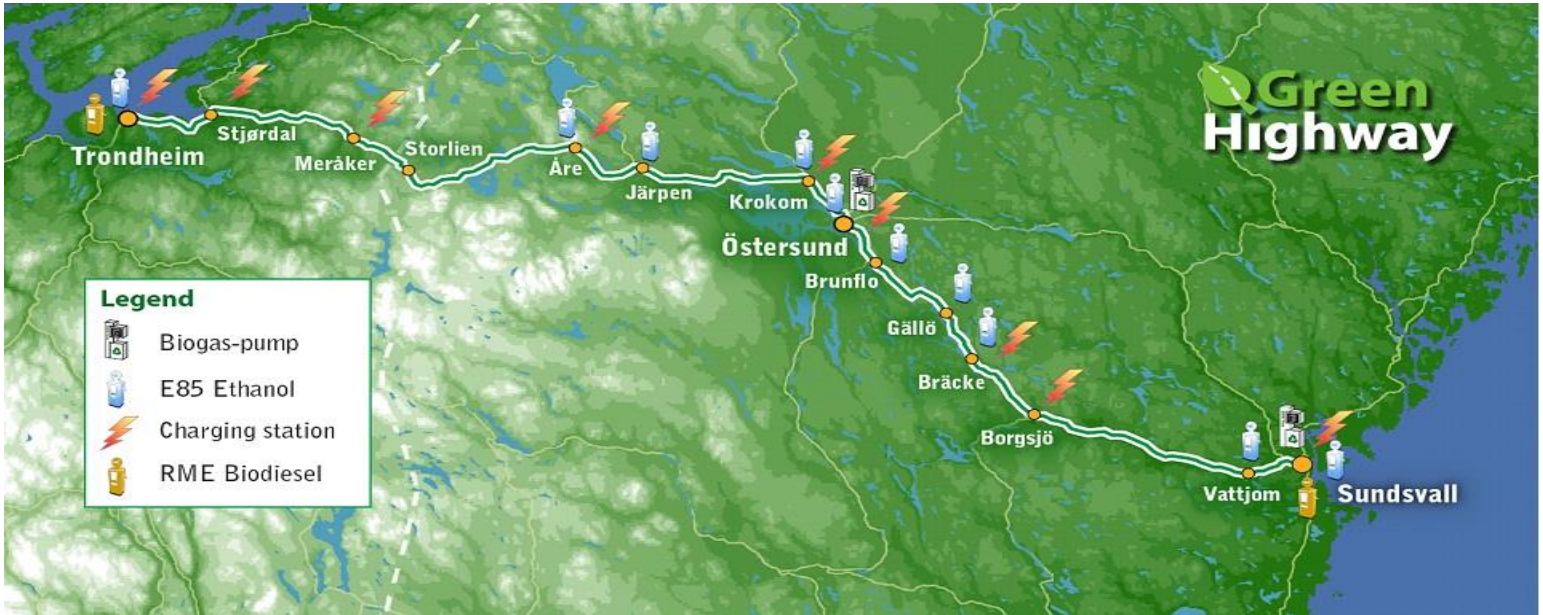
- Due to national policy/regulations they are less expensive than gas/diesel vehicles
  - Tax breaks to purchase e-cars
  - Lower roadway tolls
  - Free charging
  - Free ferries fares
  - Lower or free parking rates
  - Gas expensive, electricity relative cheap

Many Charging Stations



Green Highways

- Fossil fuel free corridor stretching from Norway to Sweden
- Freight highway
- Series of stations for renewable fuel and charging



Norway's Steep Vehicle Taxes

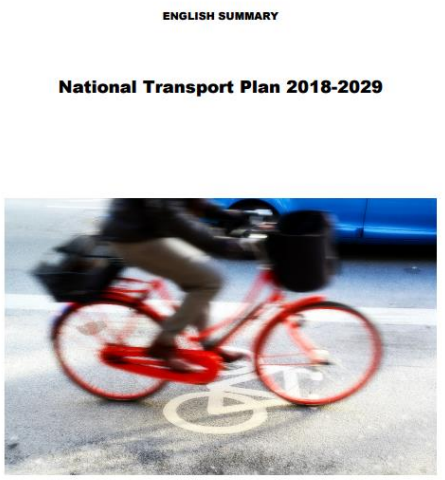
- Fuel tax (gasoline ~$8 per gallon)
- Vehicle purchase tax (tied to emissions)
- Annual registration tax
- Scrap deposit tax
- Income tax on company cars

- Electric cars not taxed near as much

- Adds around $3 billion a year to treasury

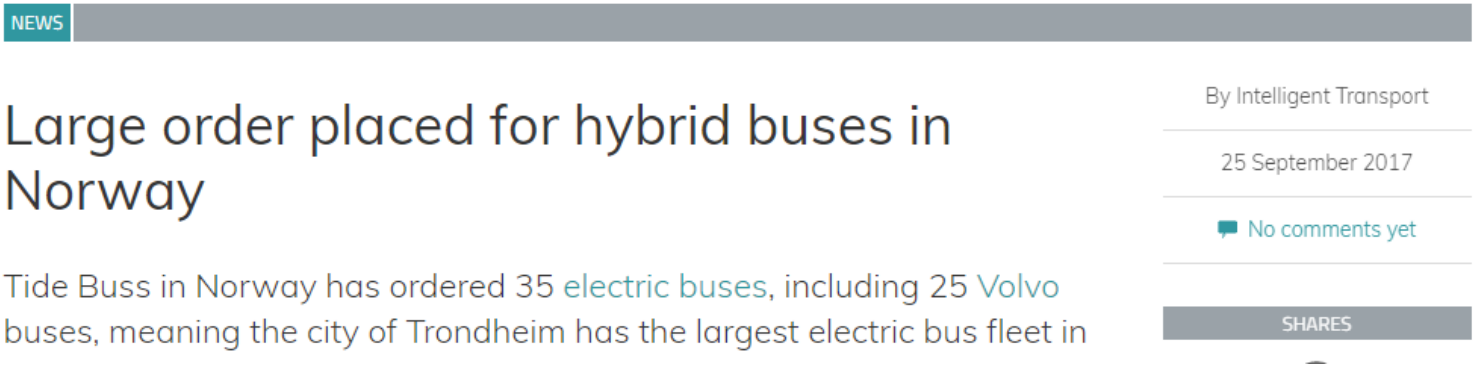
National Transport Plan (2018 - 2029)

- Prioritizes resources in transportation
- Climate considerations “are the basis of the work of the transport agencies”
- This drives many goals:
  - zero growth in car traffic
  - urban growth in transit and non-motorized modes - not in cars
  - major investment in cycling
  - move freight off roads to sea and ra
  - coordinated transportation planning
- Budget for land transport: $7.3 billion/year



National Transport Plan

- Goal - cut greenhouse gases from transport sector by 50%
- Incentives for zero and low emission transport
  - continued tax breaks and subsidies
  - parking priority
  - more charging stations to support long trips
- Significant increase in use of sustainable biofuels
- Investment in existing transit systems plus new bus rapid transit and light rail



NEWS

Large order placed for hybrid buses in Norway

By Intelligent Transport

25 September 2017

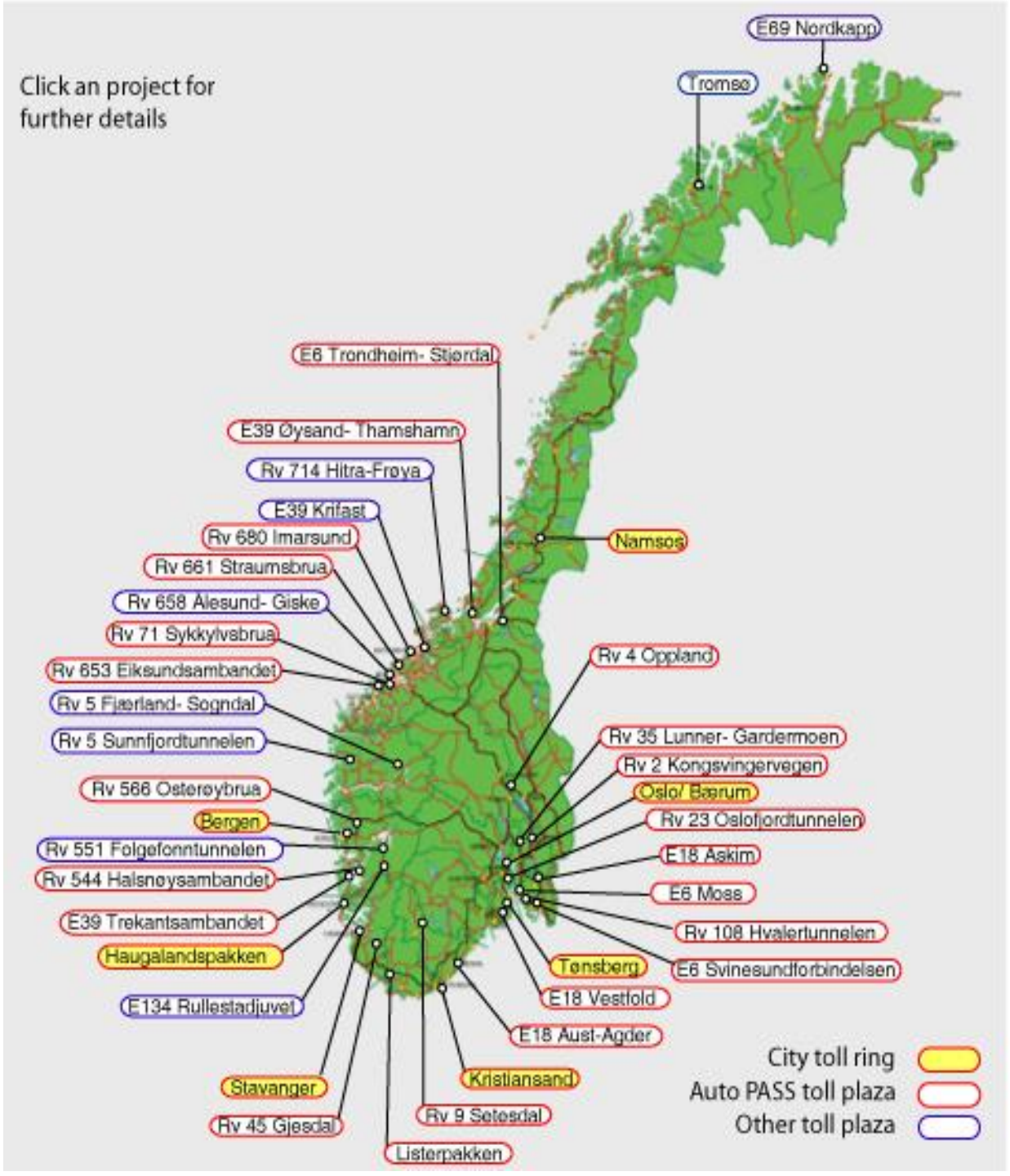
No comments yet

SHARES

Tide Buss in Norway has ordered 35 electric buses, including 25 Volvo buses, meaning the city of Trondheim has the largest electric bus fleet in

Transportation Funding - Tolls

- Common in Norway (50 toll systems currently)
- 40% of annual construction budget comes from tolls
- Tolls cover investment costs plus used to support transit and non-motorized transportation
- Tolls to reduce traffic and emissions
- Often a public-private partnerships
- Policy tool


Click an project for
further details
E69 Nordkapp
Tromsø
E6 Trondheim- Stjørdal
E39 Øysand- Thamshamn
Rv 714 Hitra-Frøya
E39 Krifast
Rv 680 Imarsund
Rv 661 Straumsbrua
Rv 658 Ålesund- Giske
Rv 71 Sykkylvsbrua
Rv 653 Eiksundsambandet
Rv 5 Fjærland- Sogndal
Rv 5 Sunnfjordtunnelen
Rv 566 Osterøybrua
Bergen
Rv 551 Folgefonntunnelen
Rv 544 Halsnøysambandet
E39 Trekantsambandet
Haugalandspakken
E134 Rullestadjuvet
Stavanger
Rv 45 Gjesdal
Listerpakken
Rv 9 Setesdal
Kristiansand
E18 Aust-Agder
E18 Vestfold
Tønsberg
E6 Svinesundforbindelsen
Rv 108 Hvalertunnelen
E6 Moss
E18 Askim
Rv 23 Oslofjordtunnelen
Oslo/ Bærum
Rv 2 Kongsvingervegen
Rv 35 Lunner- Gardermoen
Rv 4 Oppland
Namsos
City toll ring
Auto PASS toll plaza
Other toll plaza

Urban Toll Rings

- Around several major cities
- Policy and fiscal tool (with a non-motorized allocation)
- Increasing discussion about use for congestion management

Why are Tolls Common in Norway?

- Mountainous country – roads expensive
- Political parties agreed action needed
- Tolls go to new transportation infrastructure
- Tolls last only 15 years
- Toll stations do not create bottlenecks
- Toll roads are clearly higher quality
- Can have different rates for zero emission vehicles
- Pay for your impacts ethic

Non-motorized travel in Norway

- 25% of all trips on foot (USA 9%)
- 5% of all trips on bikes (USA 12%)
- Most Norwegian towns have bike/ped facilities
- Non-motorized facilities designed into most new transportation projects
- Low rate of pedestrian fatalities (2 per million people)

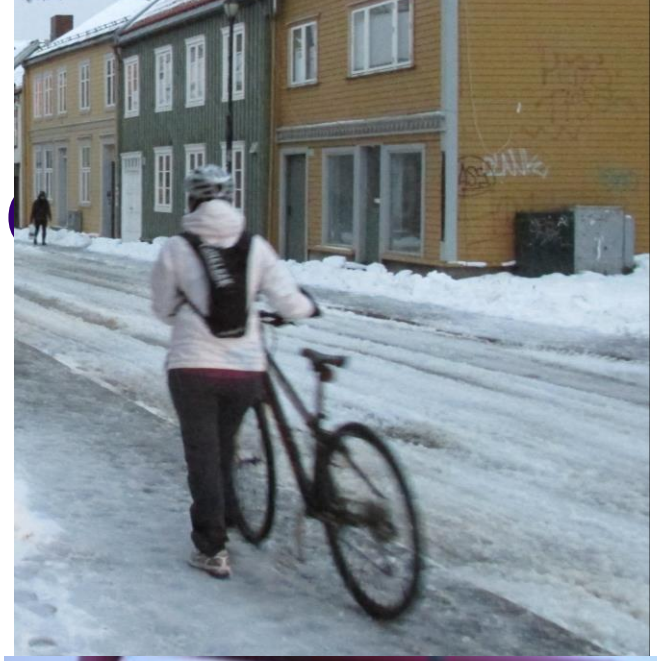
Extensive Bike and Pedestrian Infrastructure


PEPSI
MENYER


© Alfred Lapke Destination Ålesund


HALANDIA SKYDSSTATION


Nye elektriske
Volkswagen e-up!
Voltswagen.
REN TRØNDER ENERGI




Strindheim
Tyholtruta
Sentrum
Dragvoll
Moholt
Jonsvannsruta

National Transport Plan

- $923 million for pedestrian and bike infrastructure
- Goal: 10% to 20% bike ridership
- Prioritize development of 10 bike express routes in 9 major cities
  - high quality separate facilities
  - designed for fast travel (25 MPH)
  - commuter links between inner [illegible] outer suburbs

-from-norway/norwegian-proposal-goes-viral-may-spend-1-billion-on-bike-highwayshttps://www.citylab.com/solutions/2016/03/norway-bike-highways-billion-dollars/472059/ /

Urban Areas

- Fuel taxes and funding used to remove passenger cars
- Urban environmental agreements ($4.1 billion) with local governments for land use plans that supports zero growth of cars
- New transit services
- Mitigation required for projects that increase passenger cars usage

Roundabouts

- Replaced most traffic signals
- Lower cost, maintenance and energy
- Better throughput and safety

Norway and Tunnels

- Over 900 tunnels
- Replace ferry routes
- Many long and deep tunnels
- A number have roundabouts
- Adding 40 to 50 miles of tunnel per year
- Under urban areas

Ariel Schwartz/Business Insider

Sustainable Impact: Tunnels

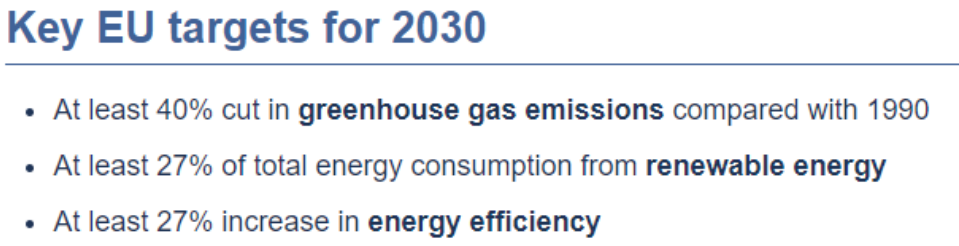
- Tunnels better in mountains (less climbing and snow plowing)
- Replace ferries
- Reduce urban congestion and optimize space

Why is Norway so Sustainable?

- Norwegian Social Attitudes
  - Equality and fairness
  - History of cooperation among equals
  - History of small farm ownership so a focus on self-independence and sustainability
  - Concern about esthetics and nature

Planning Attitudes?

- Norway
  - Top down planning
  - Driven by social mandates “e.g. Lower greenhouse gas emissions”
  - Often EU programs
  - Trust their government to do the right thing
- USA
  - Bottom up planning
  - Often driven by stakeholder concerns
  - More individual programs
  - Skepticism of government



Norway Overview

- Smaller more homogeneous society
- Citizens trust their government
- Willing to spend funds to make life better
- Oil wealth helps
- Environmental concerns always on agenda
- But also major exporter of oil and user of energy
- **Bottom line: Beautiful country and citizens interested in keeping it that way**

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