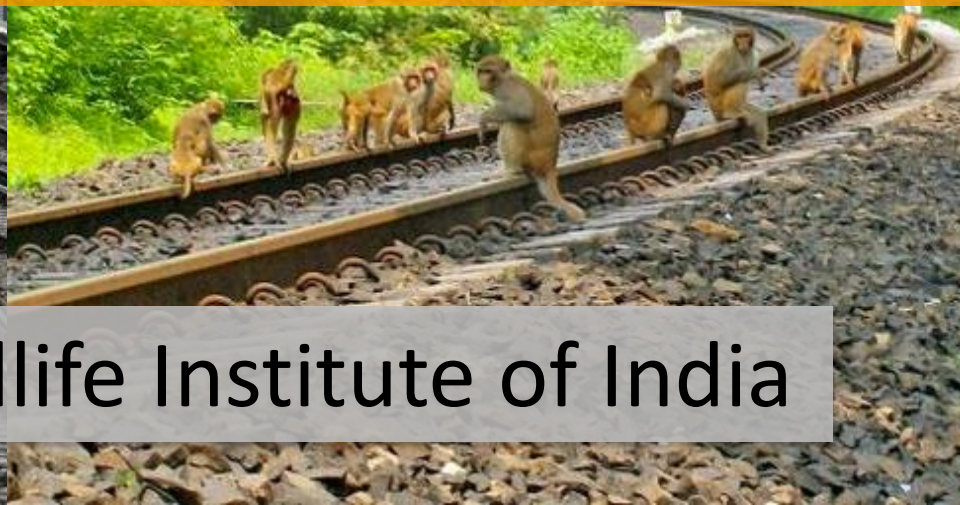


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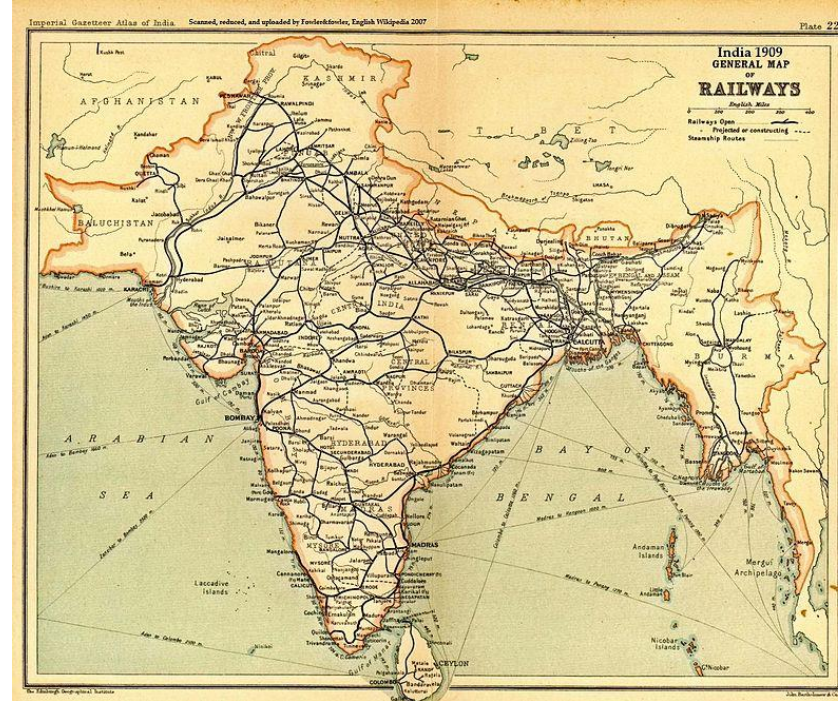
# RELEVANCE OF TRANSPORTATION ECOLOGY IN PROMOTING GREEN TRANSPORTATION INFRASTRUCTURE



Asha Rajvanshi, Wildlife Institute of India



- Indian Railways was established in 1853
- It is the third largest railway network in the world.
- Every day transportation (23 million people) is equivalent to population of Australia
- More than the entire population of the world every year.



The background of the slide is a composite image of space. On the right, a large, detailed view of the Earth is shown, displaying continents and clouds. To the left and slightly behind the Earth is the planet Saturn, with its iconic ring system clearly visible. The entire scene is set against a deep black space background with some distant starlight.

Indian Railways Trains cover 3 million km- the distance from Earth to Saturn every year

Total average distance covered by all trains (passenger+freight) on any single day in India : 3 million km or 10 times the distance to the moon!

<http://24coaches.com/indian-railways-facts-and-figures/>



# Future growth

## INDIAN RAILWAYS VISION 2020



Government of India  
Ministry of Railways  
(Railway Board)  
December, 2009

- Add 25,000 km of new lines by 2020
- Convert entire network to broad gauge
- Approx 6000 km for quadrupled lines
- Raise speeds of passenger trains to 160-200 km/h and speed of freight trains to 100 km/h
- Achieve electrification of 33,000 km of routes
- Construct 4 high speed rail projects to provide bullet trains at the speed of 250 km/h

# BRINGING SIKKIM CLOSER

The railway link will pass through steep terrain of the Kanchanjunga mountain range and the Teesta river valley



**44.9 kms**

Total distance, and will have

**28 bridges, 14 tunnels;**

**5.1 kms**

is the length of longest tunnel. More than 85% of the route will be inside tunnels

**₹1,339.48CR** Estimated cost

Original deadline: December, 2015

Stuck because of: Clearance. It goes through Mahananda Wildlife Sanctuary, where elephants are often mowed down on the existing broad-gauge rail line

## A LIFELINE

- Sikkim is a land locked state with only one major road link, the National Highway 10, which closes for days due to landslides during monsoon
- Strategically located, Sikkim suffers from perennial short supply of essential commodities when roads are blocked
- The state lacks super specialty medical facilities and depends on other parts of the country. At times patients die while being taken to Siliguri by road

## STRATEGIC VALUE

Since Sikkim shares border with China, the rail link will enable military movement to the region in short times

# Railway tracks threaten bison in Karnataka

- 10 bison succumbed to train collisions over six months in Khanapur reserved forest, Karnataka.
- Food thrown out of passing trains attracted these bovines and lead to collisions
- A proposal to raise barbed wire beside the railway tracks cutting through forested areas, not complied with due to a dearth of funds.



Source:

[www.deccanchronicle.com/in-other-news/220317/bison-run-over-by-train-in-belagavi.html](http://www.deccanchronicle.com/in-other-news/220317/bison-run-over-by-train-in-belagavi.html)

[www.newindianexpress.com/states/Karnataka/2017/mar/20/train-kills-bison-making-it-tenth-incident-in-six-months-in-Karnataka-1583363](http://www.newindianexpress.com/states/Karnataka/2017/mar/20/train-kills-bison-making-it-tenth-incident-in-six-months-in-Karnataka-1583363)



## Fatal crossings

West Bengal and Assam, both put together have accounted for 37 out of the 49 deaths of elephants on train tracks across the country

### ELEPHANT DEATHS IN TRAIN ACCIDENTS

9

2015-16

21

2016-17

19

2017-18

### TIGER/LION DEATHS

Tiger

Lion

Year	Road accidents		Train accidents	
2015-16	2	0	3	0
2016-17	1	1	2	1
2017-18	0	3	3	0



**Danger zone:** A wild elephant entering railway track near Walayar in Kerala. ■ K. K MUSTAFAH





Similar developments are pervasive in many regions, with some features occurring at densities similar to or greater than roads.



# A BOOMING MARKET

“The **rail transport market** has been significantly growing in recent years driven by **urban population growth**, increase in demand for **mobility**, and a growing concern for **transport's environmental impact**.”



€150  
billion

annual rail  
industry market  
between 2011 and  
2013

€30  
billion

share of  
infrastructure  
in global  
spending

+2.5%

expected annual growth  
rate for global rail  
equipment by 2019

+50%

growth in European rail  
passengers by 2050

+80%

growth in European  
freight volumes by 2050

# ACCELERATING GROWTH IN THE REGION VIA SOHAR

The Middle East has embarked on the most ambitious rail network ever...

Work has already begun on  
the first phase in Oman...



Plans to connect ports with  
consumer markets in the UAE  
and Saudi Arabia

Connecting  
**6 countries**

Bahrain, Kuwait, Qatar,  
UAE, Saudi Arabia and Oman



Investment of  
**US\$250  
Billion**

**US\$8 billion**

Estimated to increase the  
logistics market value from  
US\$8 Billion to US\$12 Billion

**US\$12 billion**

**2,244**

Kilometres of freight and  
passenger rail infrastructure

**67,000**

Kilometres of railway line

**US\$50  
Billion**

Set to boost the logistics  
market value to an estimated  
US\$50 Billion in 2017

**US\$35  
Billion**

Medina

SAUDI ARABIA

Jeddah

Mecca

Access to  
**3.5 Billion**  
consumers

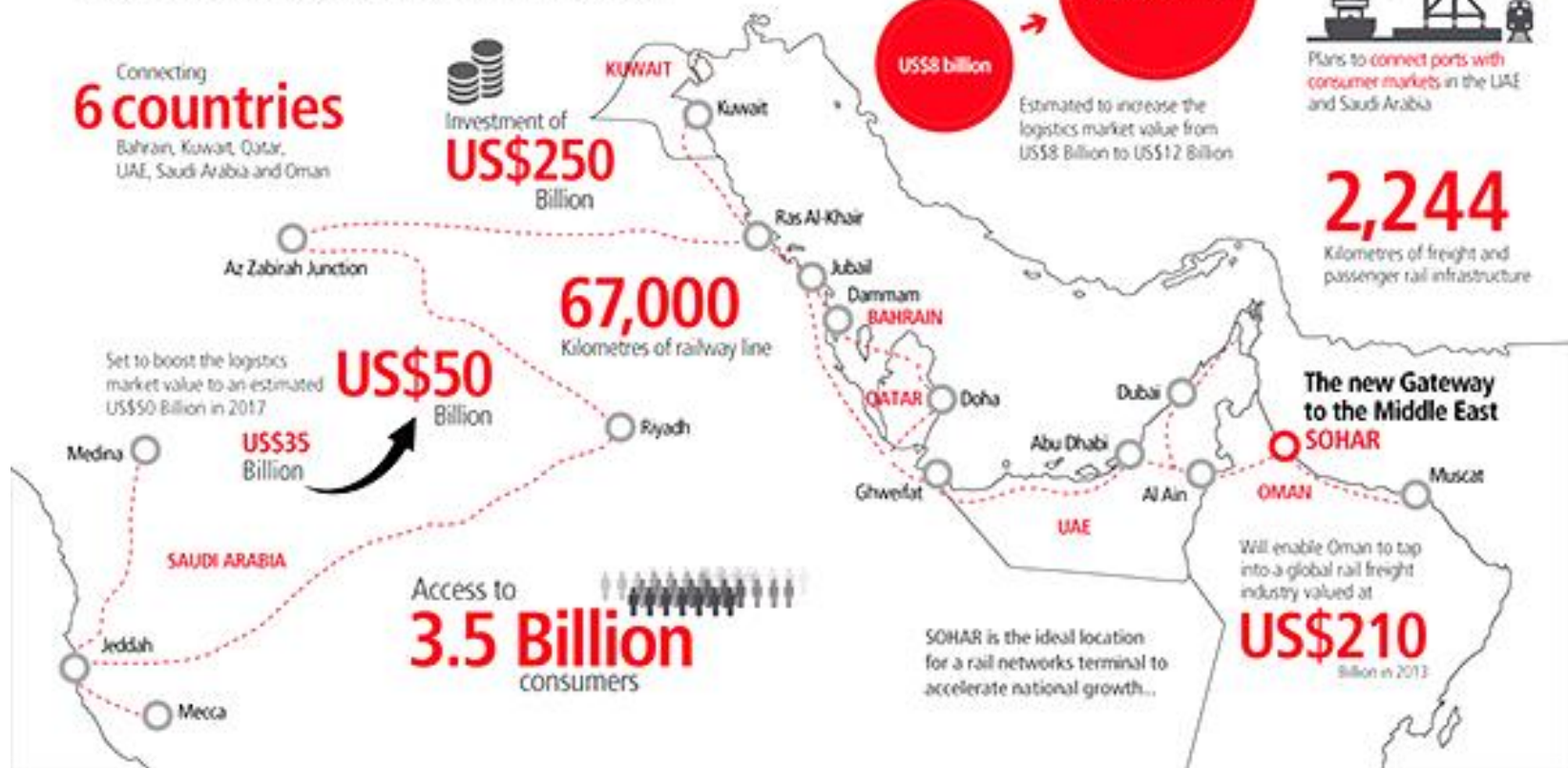


SOHAR is the ideal location  
for a rail networks terminal to  
accelerate national growth...

The new Gateway  
to the Middle East  
**SOHAR**

**US\$210**  
Billion in 2013

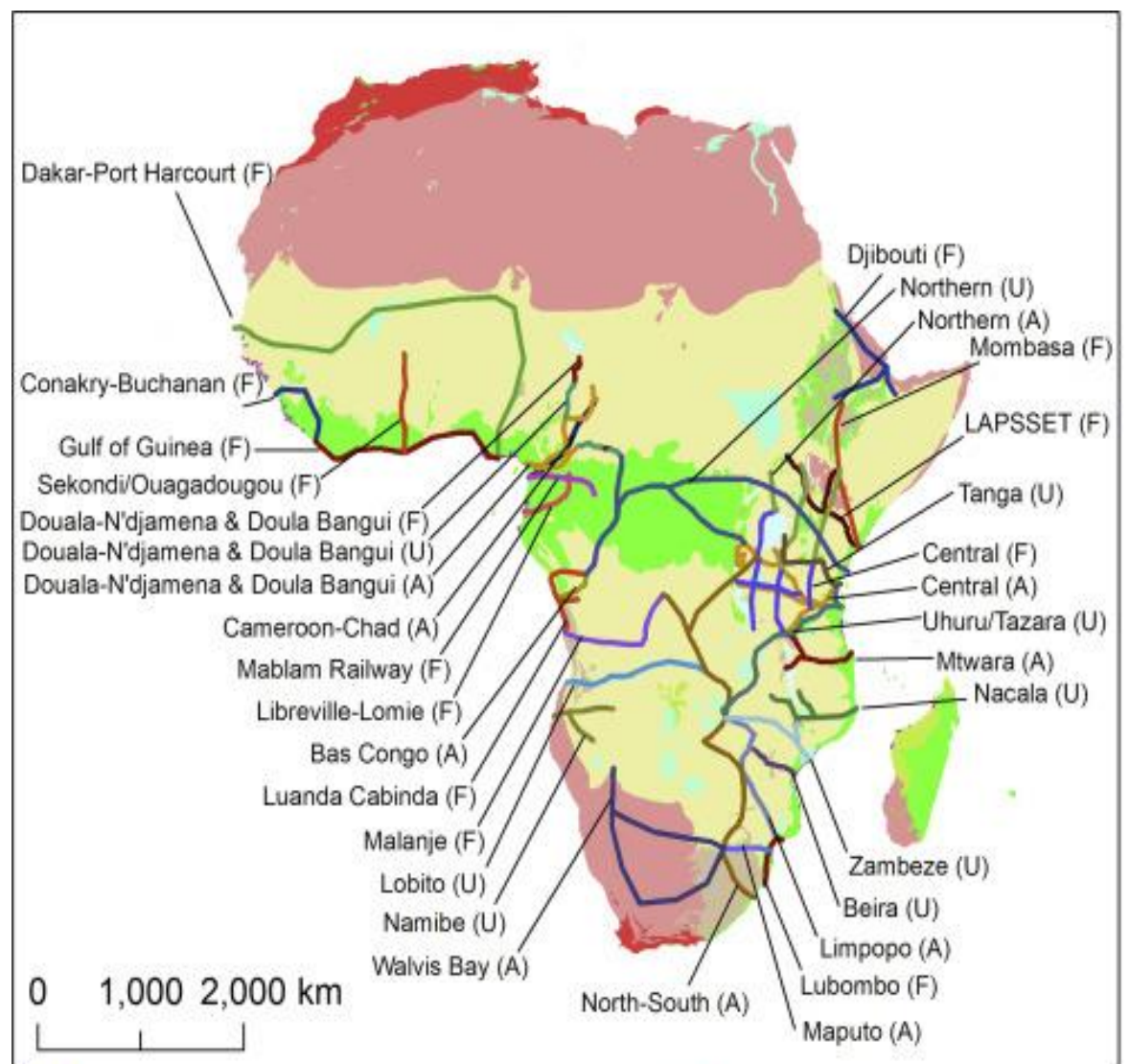
Will enable Oman to tap  
into a global rail freight  
industry valued at





# 53,000 km of linear infrastructure planned or underway in Africa

- 33 separate projects
- Dissect 400 protected areas & degrade 1800 more



Laurance et al. 2015, Current Biol

# The Qinghai-Tibet Railway,



5,072 m asl- world's highest rail track

Loss of vegetation and top soil



Damage to the wildlife habitats of the Tibetan antelope





# Rows and conflicts over rail projects

Multibillion-euro Stuttgart 21 rail project project in southern Germany

Row over environmental concerns viability, risk to threatened species of lizard





# Construction will hit up to 500,000 people... and scar towns, villages and beauty spots



**NOISE:** HS2 lorry routes will cut through many unspoilt towns

## BUILDING DISRUPTION

THE CPRE evidence reveals that towns up to 25 miles from the line are on routes that will be used by construction traffic for up to seven years.



### PRINCES RISBOROUGH

**1** THIS small town in Buckinghamshire predates the Domesday Book and is just off the Icknield Way, a pre-Roman road from Norfolk to Wiltshire. Six miles from the line, it will have convoys of lorries entering it from three directions.



### CAERSFIELD

**2** THE tiny Oxfordshire hamlet has fewer than 100 people. It sits on the route of the line six miles from the construction site.



### CHARWELTON

**3** CHARWELTON last had a train run through it in 1969, when a freight line shut. The village near Daventry in Northamptonshire will see lorries thundering past from the HS2 line to the M1, which is just to the north.

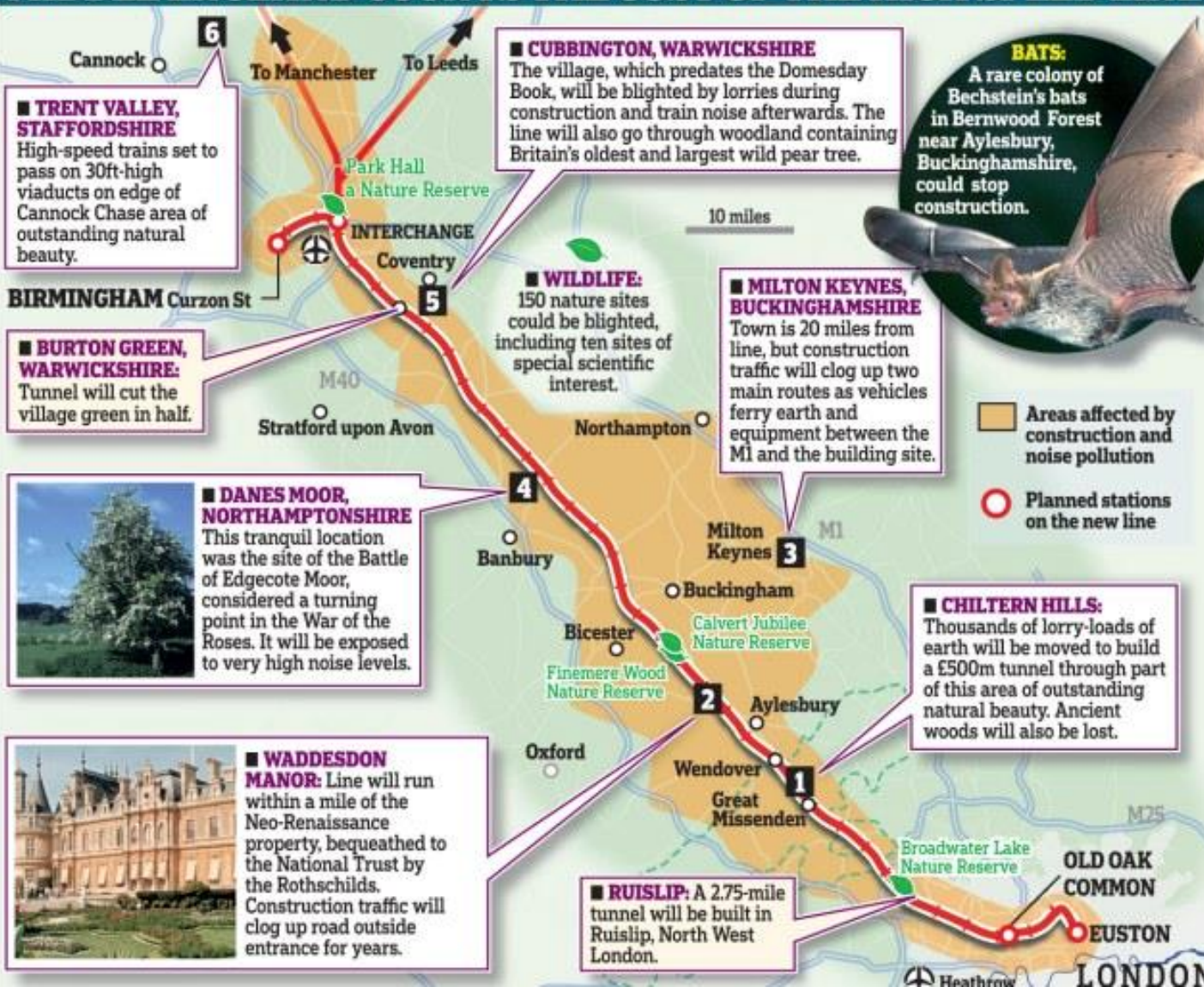


## WHAT THIS MAP SHOWS

THE pink area shows how construction and noise pollution will affect towns and villages up to 20 miles from the track once phase one of HS2 is up and running.

second proposed phase will extend the line in a Y-shape beyond Birmingham and further north to Leeds and Manchester. Our graphic is based on maps created by the

## MIDDLE ENGLAND COUNTS THE COST OF THE HIGH SPEED LINE





# 8 km long track in Palamu TR, Jharkhand

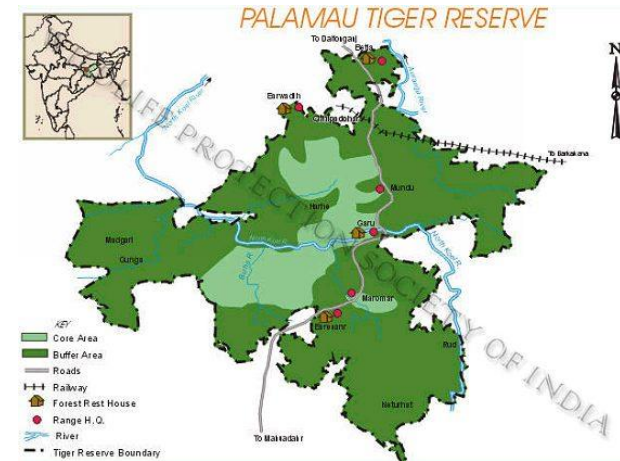
**70 trains/day**

**Grave threat to Palamu's small (160) elephant population**

**Non compliance to speed limit (20 kmph) by IR**

**Poor manning of tracks by FD because of high vacancies (90%) and fear of Naxal landmines**

**Consequence 6 elephants (mostly calves and young sub-adults) killed in last 9 years**







Railway projects would increasingly pose many different forms of impacts and more complex challenges

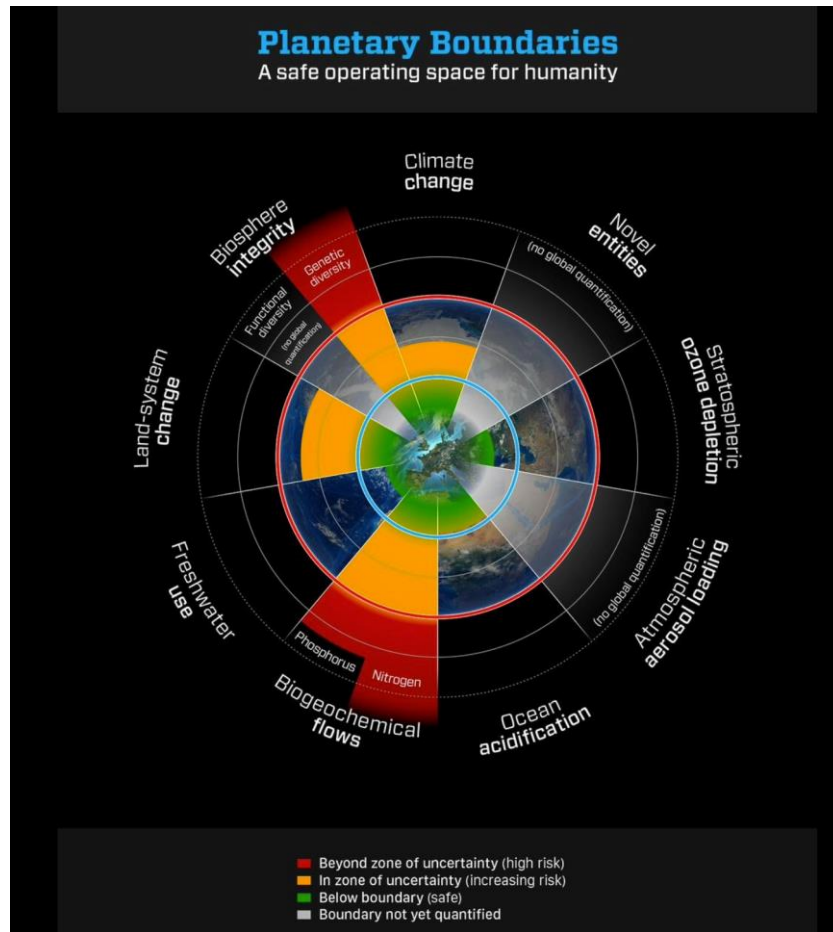




The Road network of India is second largest road network in the world



# Planetary Boundaries: A safe operating space for humanity



Four planetary processes assessed in global risk zone:

- i. *Land use change*
- ii. *Climate change,*
- iii. *Loss of biosphere integrity,*
- iv. *Biogeochemical cycles.*

Biodiversity is a solution that itself faces many challenges



# Transportation Ecology

*Keeping wildlife move safely across roads and rails*





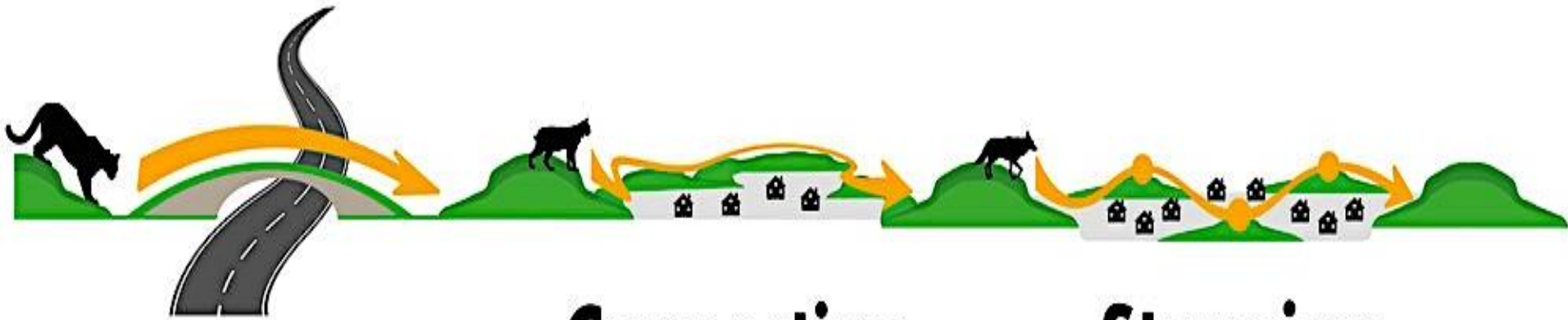


What roads can do in a landscape ?





# Connectivity Conservation: Approaches



## Crossings

Overpasses or underpasses that help animals move across barriers such as freeways.



## Connective Habitat

Uninterrupted areas of natural land that connect two or more large habitat hubs.



## Stepping Stone

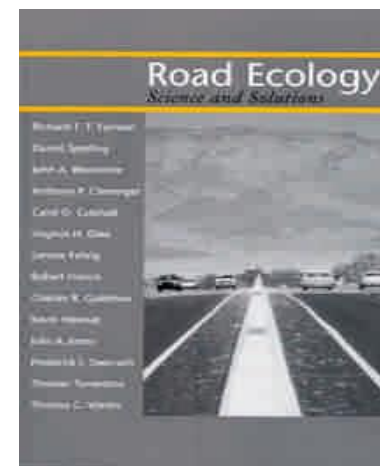
A series of unconnected habitat areas that provide shelter or food between larger habitat hubs.



# TRANSPORTATION ECOLOGY

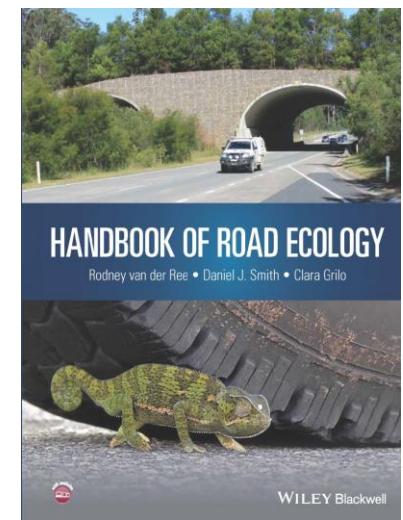
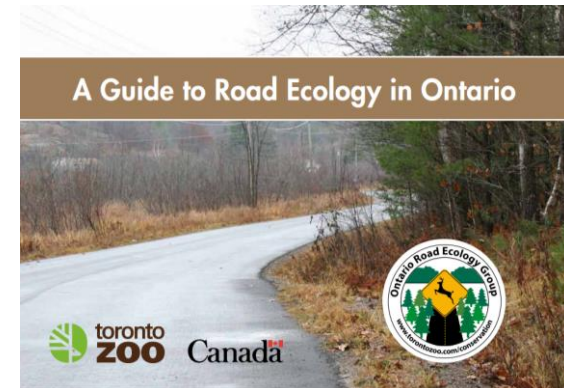
(Science examining the relations between humans, transport and the environment)

*Emergence of a discipline that recognises the theoretical overlap between road and railway ecology*



**ROAD ECOLOGY**— More dominant stream, involving study of the interaction between road networks and the natural environment.

Started in Europe in the 1970s and later spread to the U.S.





Transportation and ecology professionals are continually challenged to find commonly shared goals

Environmental Pollution

## The Ecology of Transportation: Managing Mobility for the Environment

John Davaquon and Julia L. Davaquon (Eds.)



Springer

Reihe Realwissenschaften



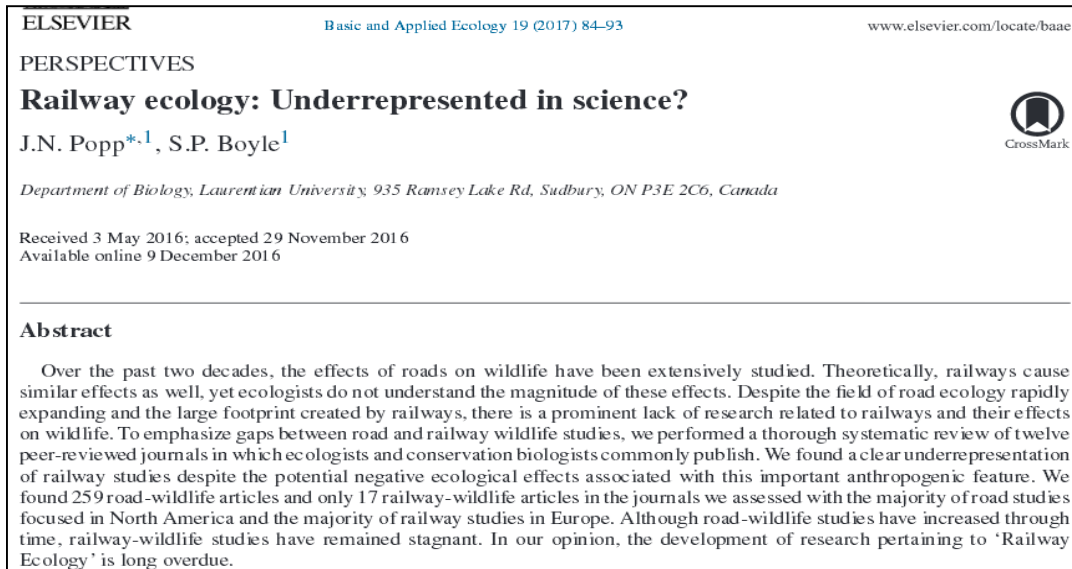
Slaven Rupić

## Ecology and Transportation

Innovative Tool for Environmental Impact  
Assessment and Transportation Planning

AkademikerVerlag

# RAIL ECOLOGY : study of the ecological community growing along railway tracks and the effects of railroads on natural conditions



There were 259  
road-wildlife  
articles and 17  
railway-wildlife  
articles – 15 times  
less !





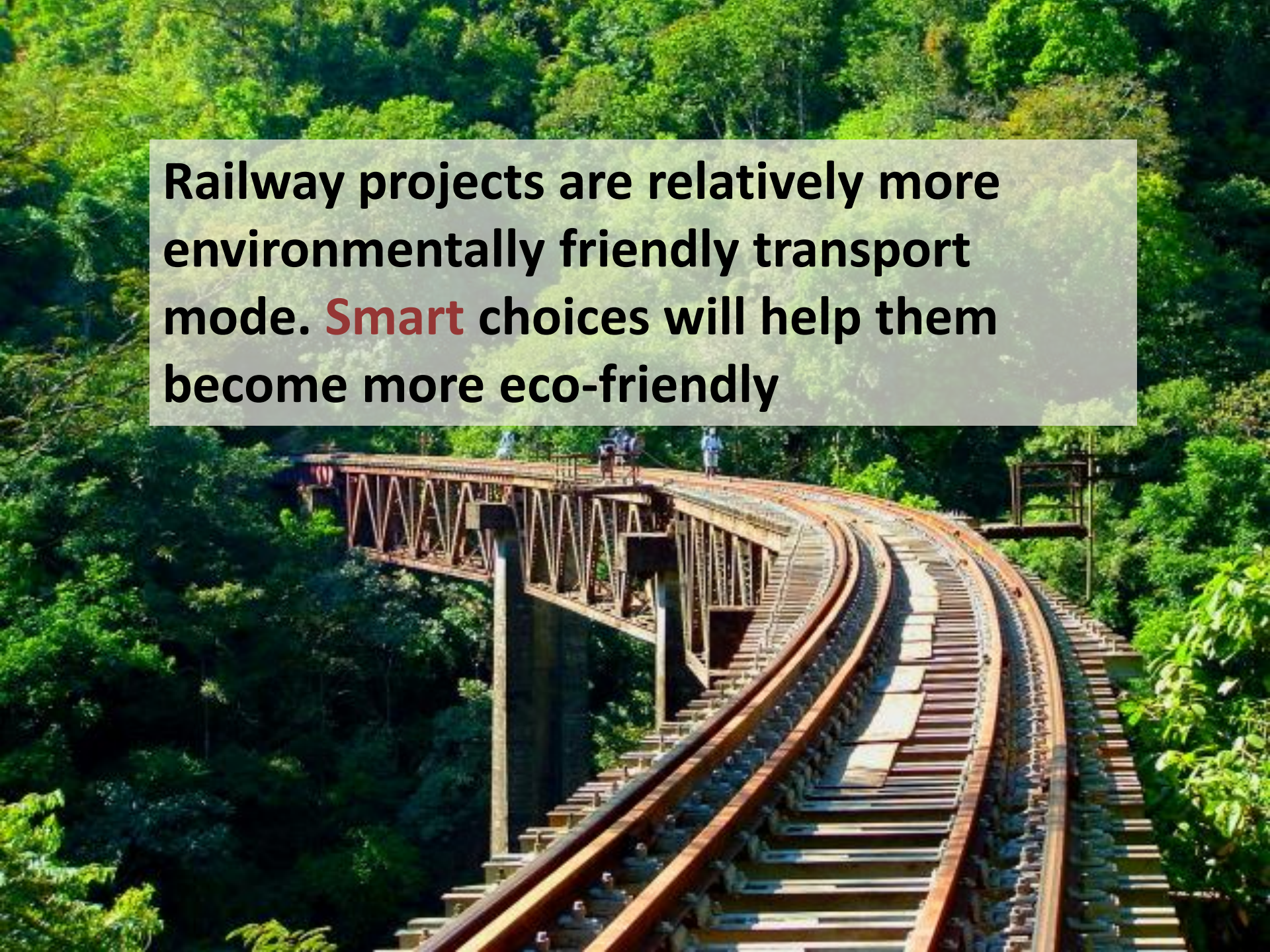
(2017) Borda-de- Agua, L., Barrientos, R., Beja, P., Pereira, H.M. (Eds.) Springer (in Press)

Provides a unique overview of the impacts of railways on biodiversity

Presents international case studies on wildlife populations in Europe, Asia, and North America

Demonstrates how railway ecology plays a major role in transport systems and reducing carbon footprints

Railway projects are relatively more environmentally friendly transport mode. **Smart** choices will help them become more eco-friendly



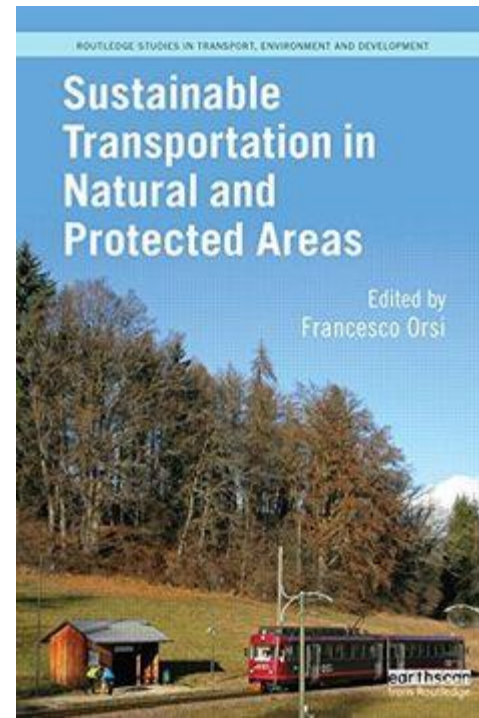


Sustainable transport measures have been invoked, conceived and adopted in the urban context to tackle environmental impacts (noise, atmospheric pollution, land conversion) and improve socio-economic wellbeing



Figure 2.3 A sustainable transportation system should satisfy a number of requisites referring to the three components of sustainability (i.e. environment, society, economy). Each requisite individually may refer to one or even two of such components.

Commitments favouring sustainable form of mobility favouring natural settings (protected areas and wilderness areas) more recent



# Essentials of a sustainable railway system...

Minimises atmospheric pollution,

Minimises noise

Minimises land conversion

Minimises impacts of visitation while providing recreational benefits

Reduces ecological footprint

Safeguards integrity of natural habitats

Promotes quality of life of local people

Assures financial viability





*Sustainability*

**MUST CREATE AND MAINTAIN THE  
CONDITIONS UNDER WHICH HUMANS  
AND NATURE CAN EXIST IN PRODUCTIVE  
HARMONY**

Thank you