

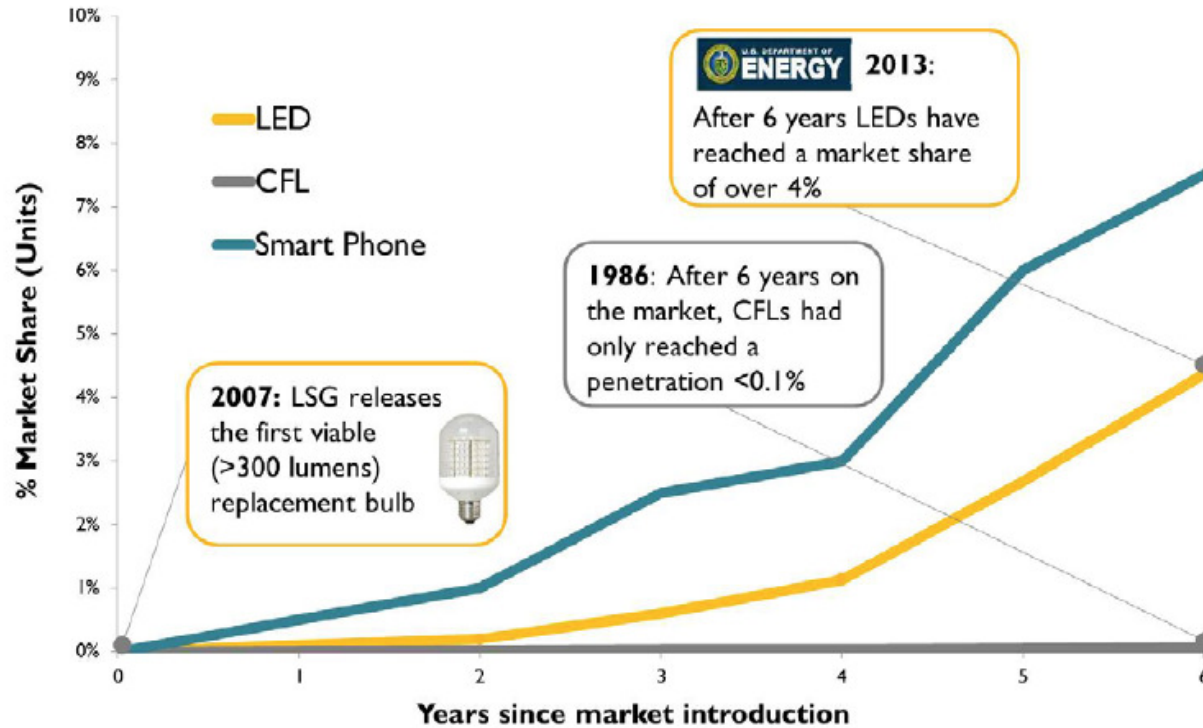
LED lighting and controls research presents a new paradigm

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Revolution = New paradigm

1. LED = Catalyst
 2. Safety effects of Road Lighting can no longer be ignored
 3. Strategic Asset Management
 4. Information Systems
- ➔ New Paradigm

1. LED Penetration



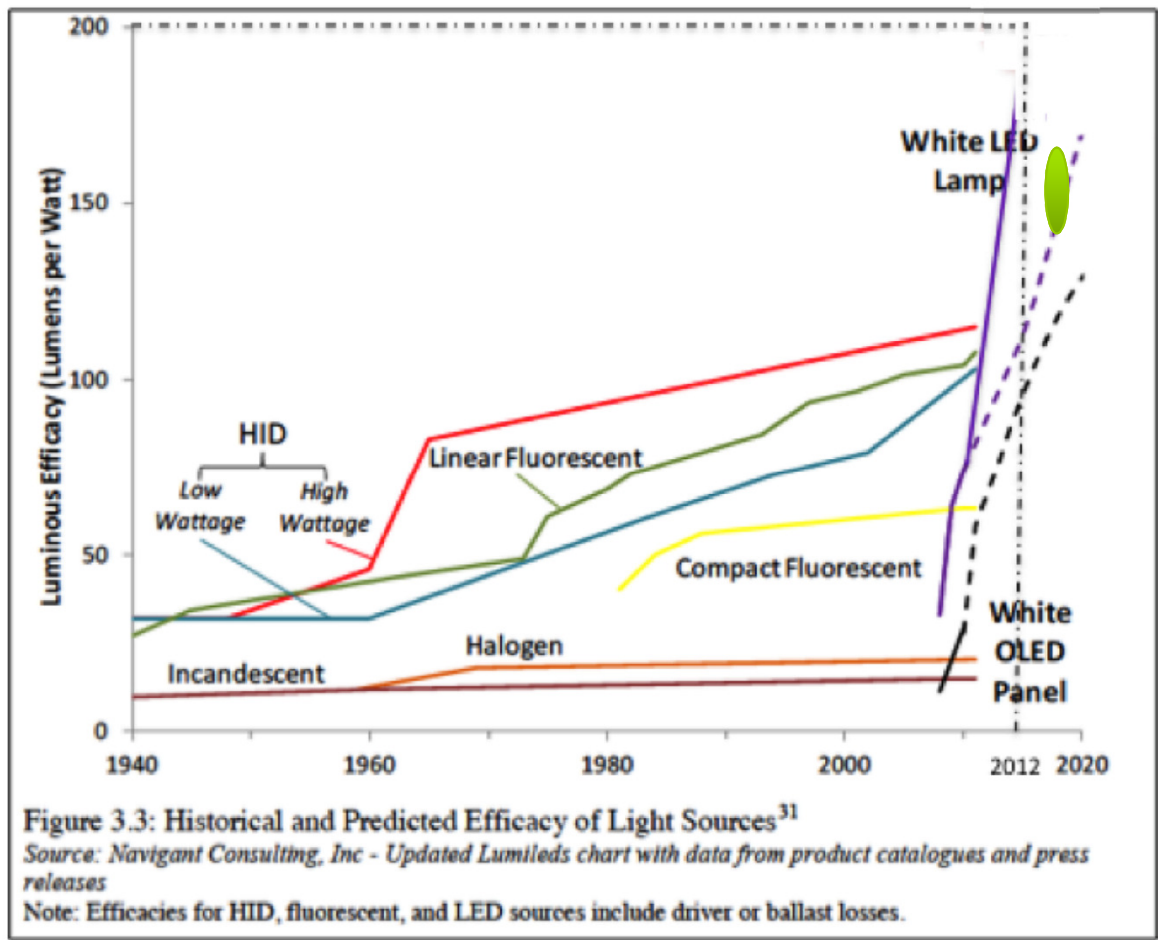
Source: U.S. Department of Energy, "Solid-State Lighting: Early Lessons Learned on the Way to Market" January 2014

LED Efficacy

Table 1.1. Summary of LED Package Price and Performance Projections

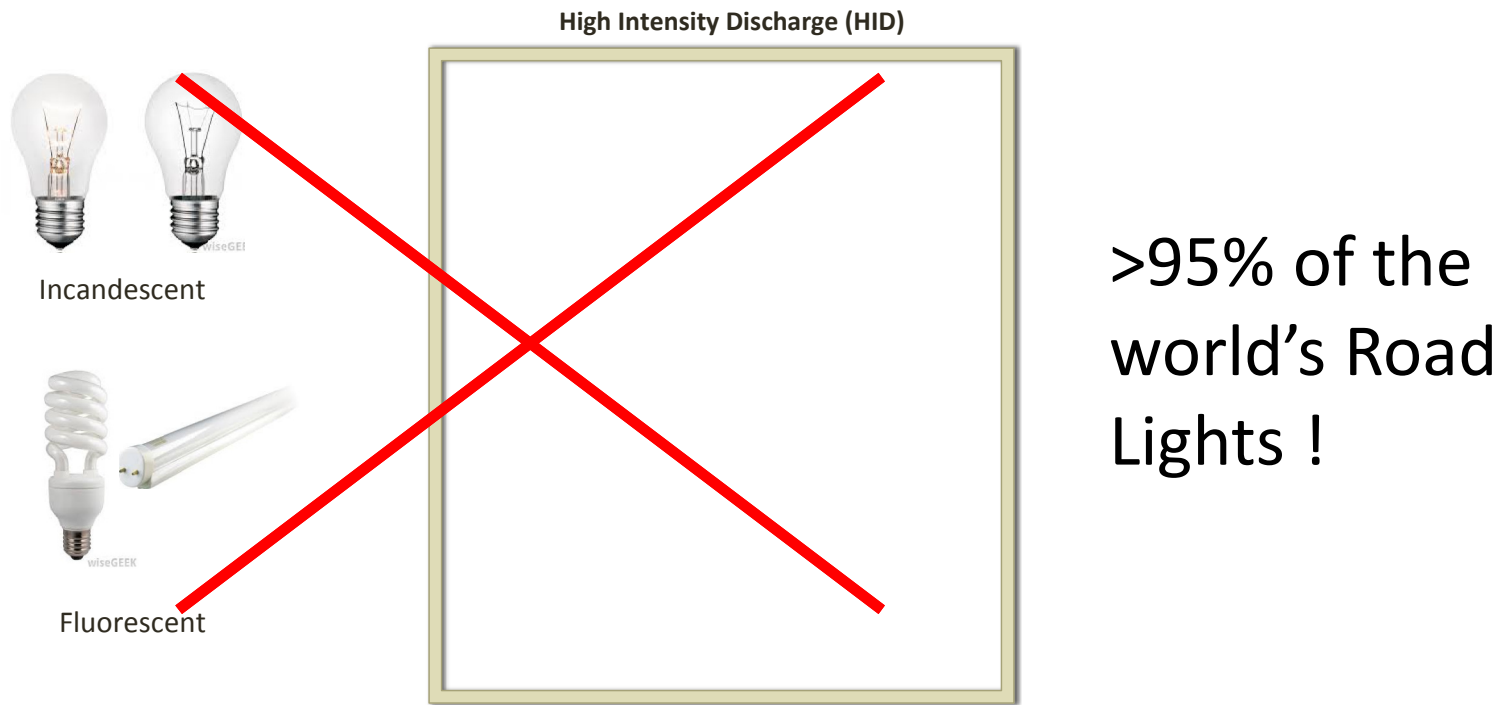
	2012	2013	2015	2020	Goal
Cool-White Efficacy (lm/W)	150	164	190	235	266
Cool-White Price (\$/klm)	6	4	2	0.7	0.5
Warm-White Efficacy (lm/W)	113	129	162	224	266
Warm-White Price (\$/klm)	7.9	5.1	2.3	0.7	0.5

Source: U.S. Department of Energy, “Solid-State Lighting: Early Lessons Learned on the Way to Market” January 2014



Legacy Technologies

High Intensity Discharge (HID)



Incandescent

Fluorescent

>95% of the world's Road Lights !

2. Safety Effects of Road Lighting Depend on:

- a. Availability (on or off)
- b. Quantity (how much)
- c. Colour (white or yellow)
- d. Government action (rules)

a. Well-accepted research shows lighting saves lives & injuries

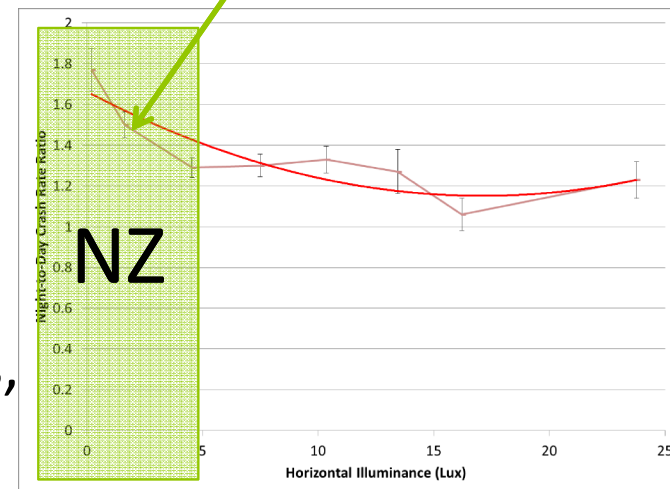
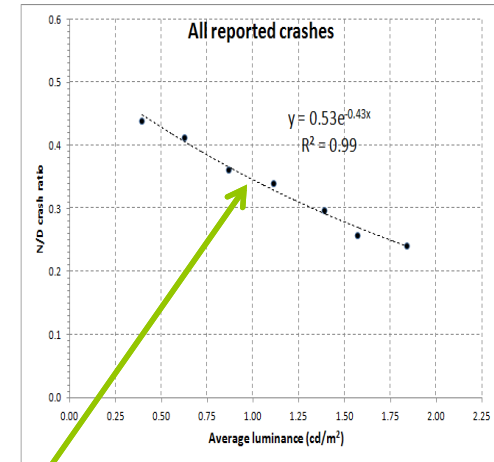
Handbook of Road Safety Measures (Elvik 2009):

- By 2007 there were 70 studies with 503 results on road lighting showing that:
- Lighting reduces the risk of fatal accidents on rural roads by 87% and injury accidents on motorways by 4%
- NZTA guidelines = 35%. Every fatal accident avoided is worth \$3 million!

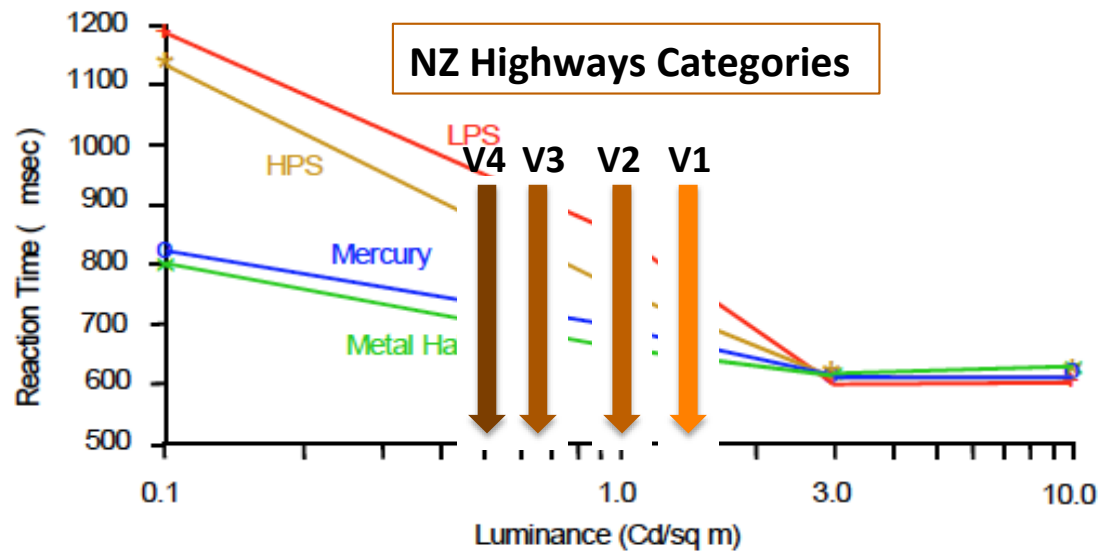


b. Quantity or Dosage

- Jackett & Frith 2012 “For every 0.5cd/m² increase in lighting level, midblock injury crashes reduce by 33%, (n = 7,944, 2006-10)”
- Gibbons 2013 “Anywhere there is less than 5 Lux Horizontal Illuminance, injuries will be reduced by increasing light levels” (23,845 crashes over 6 years, 986.8 miles or 1,588 km)”



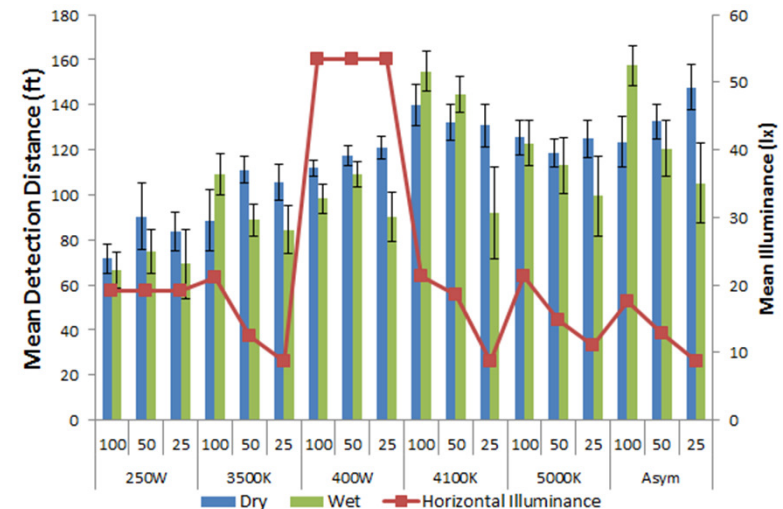
c. Colour – Old Research



Source: Arizona Department of Transportation

Colour – New Research

- Gibbons & Clanton 2013
“146W LED white light dimmed to 25% of its rated output provided the same stopping distance (due to reaction times) on wet roads compared with full intensity 250W High Pressure Sodium street lighting on dry roads”



A Policy Blind-spot?

- Safer Journeys “... is designed to guide New Zealand’s efforts to improve road safety for the next 10 years. It sets out the direction and actions we will take to reduce the number of deaths and injuries on our roads.” Minister of Transport, 2010
- Like most Strategic Transport documents world-wide, there is no mention of “lighting”



3. Management of Safety Assets

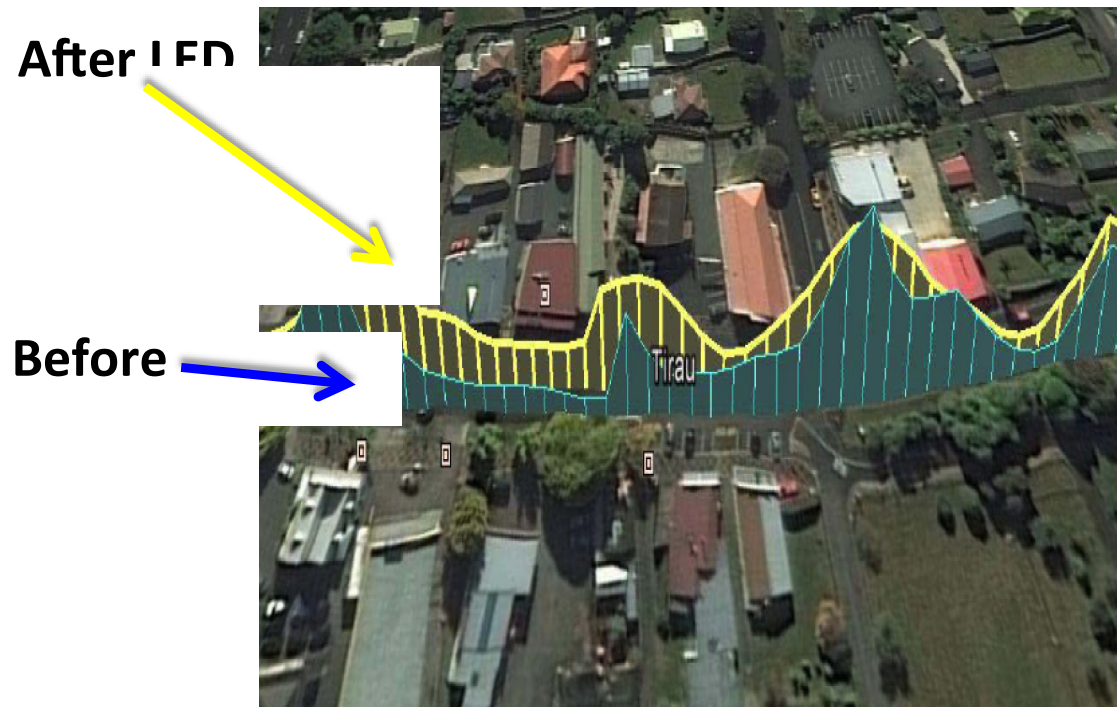
- Standards exist everywhere for design & construction
- There are none to monitor a 15-20 year asset which deteriorates (like all assets), gets dirty, and overgrown with vegetation
- No “best practice” asset management for something that saves lives and reduces crime

Lux Mapping



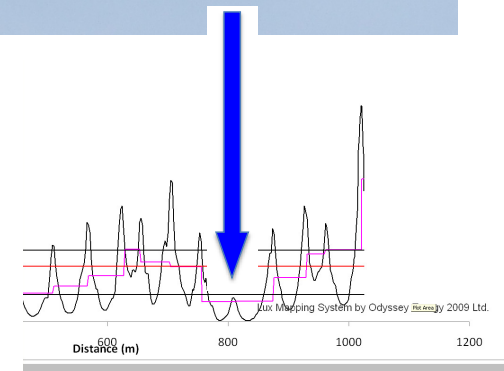
Source: Odyssey Energy

Before and after LED



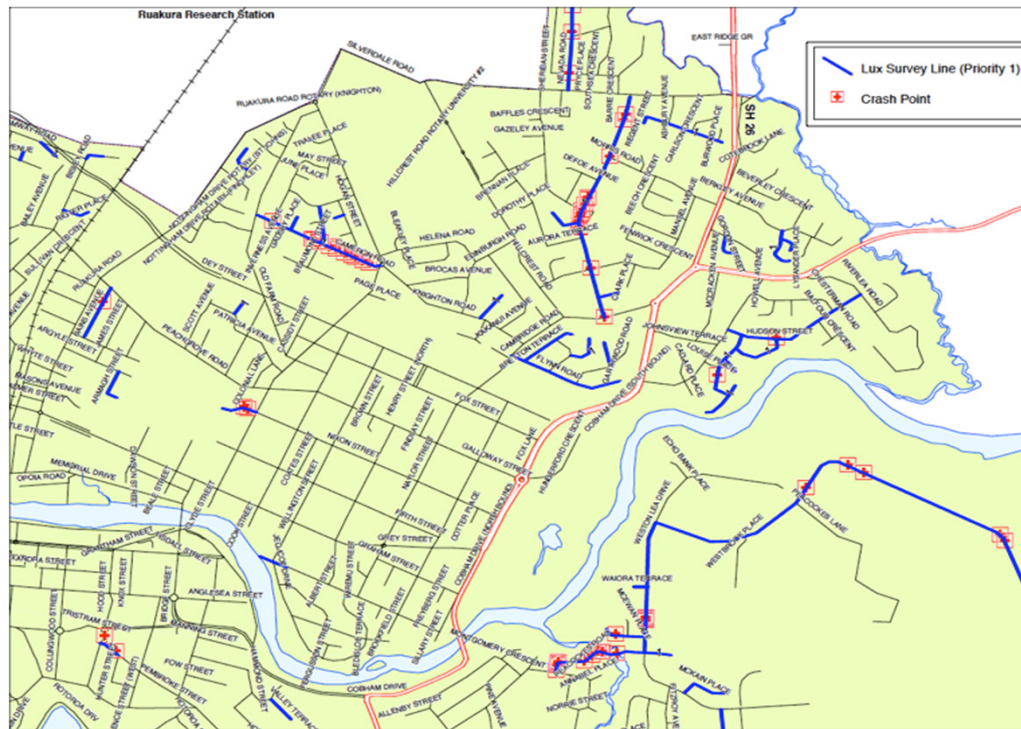
Source:
Odyssey
Energy

Lack of Maintenance



Source: Odyssey Energy

Crash Mapping



Source: Hamilton City Council

When the World wakes up

- Road lighting will be controlled everywhere by computers doing a much better job than humans are currently doing.