Smart Freight Week
International Urban Freight Conference

METRANS Transportation Center
Long Beach, CA
October 16-18, 2019

Photo: Kat Janowicz

Technology Evaluation Methods for Informed Decision-Making

Use Energy Responsibly

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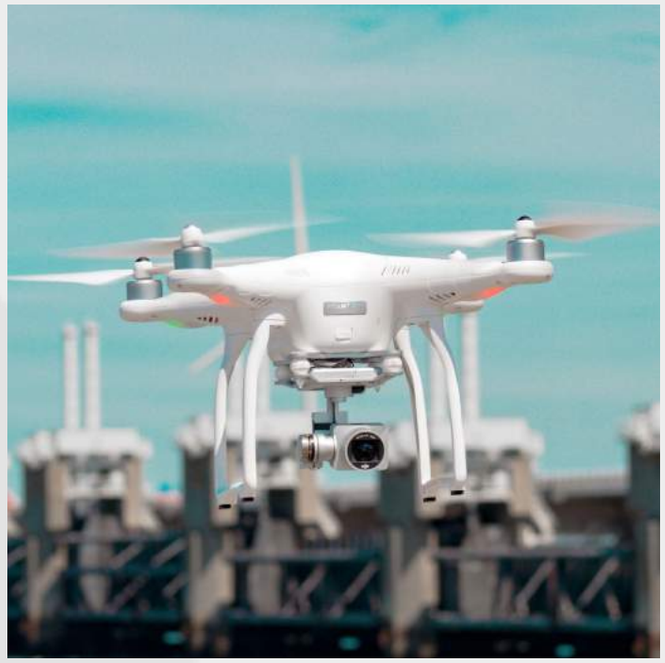
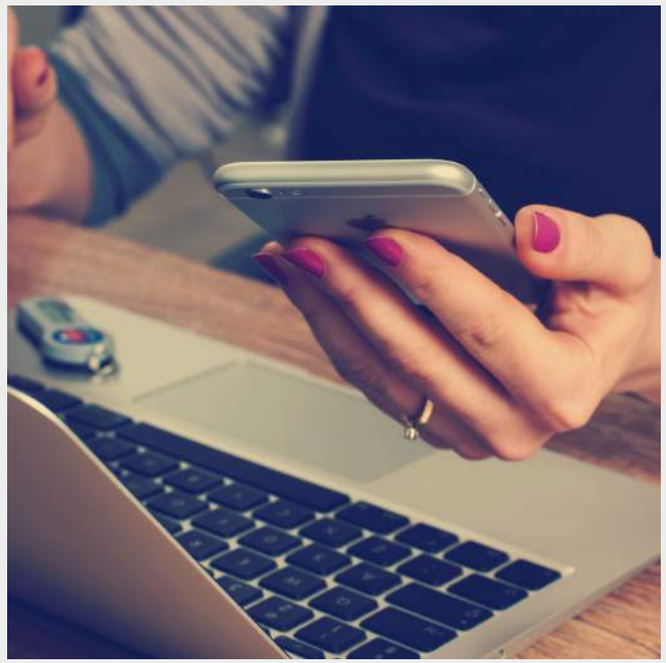
Examples of Transformative Technologies





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Technology Evaluation Process

Define Parameters	Vision, goals and objectives	Drivers and rationale	Limitations
Understand the Context	Complexity, boundaries	Stakeholders, decision makers	Risk and uncertainty
Develop a Plan	Methods to collect data	Methods to analyze data	Feasible assumptions
Collect Information	Performance	Lessons learned	Ongoing operations
Assess and Analyze Data	Criteria and trade-offs	Qualitative vs. quantitative	Potential for deployment
Present Recommendations	Understand the audience	Engage	Assume bias

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Example Drivers

Single technology

Make investment

Multiple technologies

Meet targets

One or multiple technologies

Award grant funding

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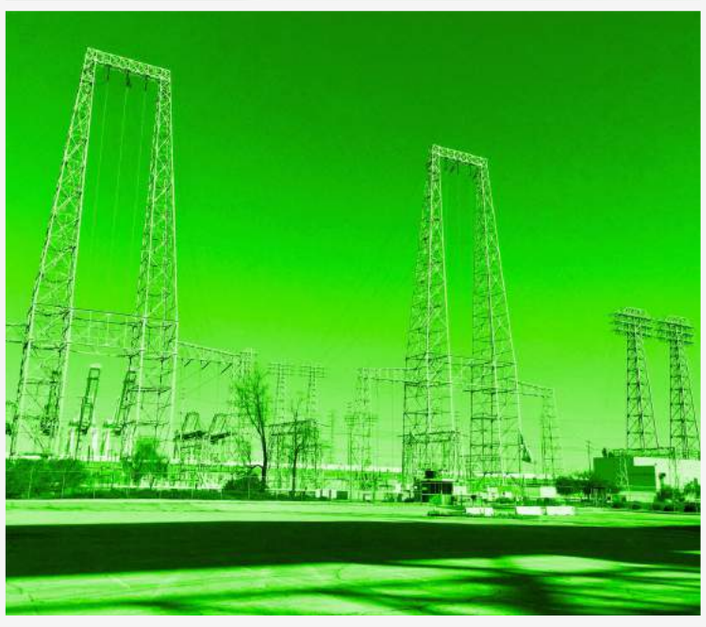
Focus on Transportation and Energy



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Understand the Context

SOUTHERN CALIFORNIA

ECONOMIC DEVELOPMENT

jobs, workforce, education, competitiveness, politics

ENVIRONMENT & SUSTAINABILITY

air quality, noise, climate change, energy, water

INDUSTRY

seaports, airports, technology, manufacturing, warehousing

LOCATION

topography, urban sprawl, distances, tech hub

TRANSPORTATION GOODS MOVEMENT

traffic, congestion, noise, pollution, public transit

QUALITY OF LIFE

culture, diversity, equity, tourism, entertainment

Photo: Cameron Venti

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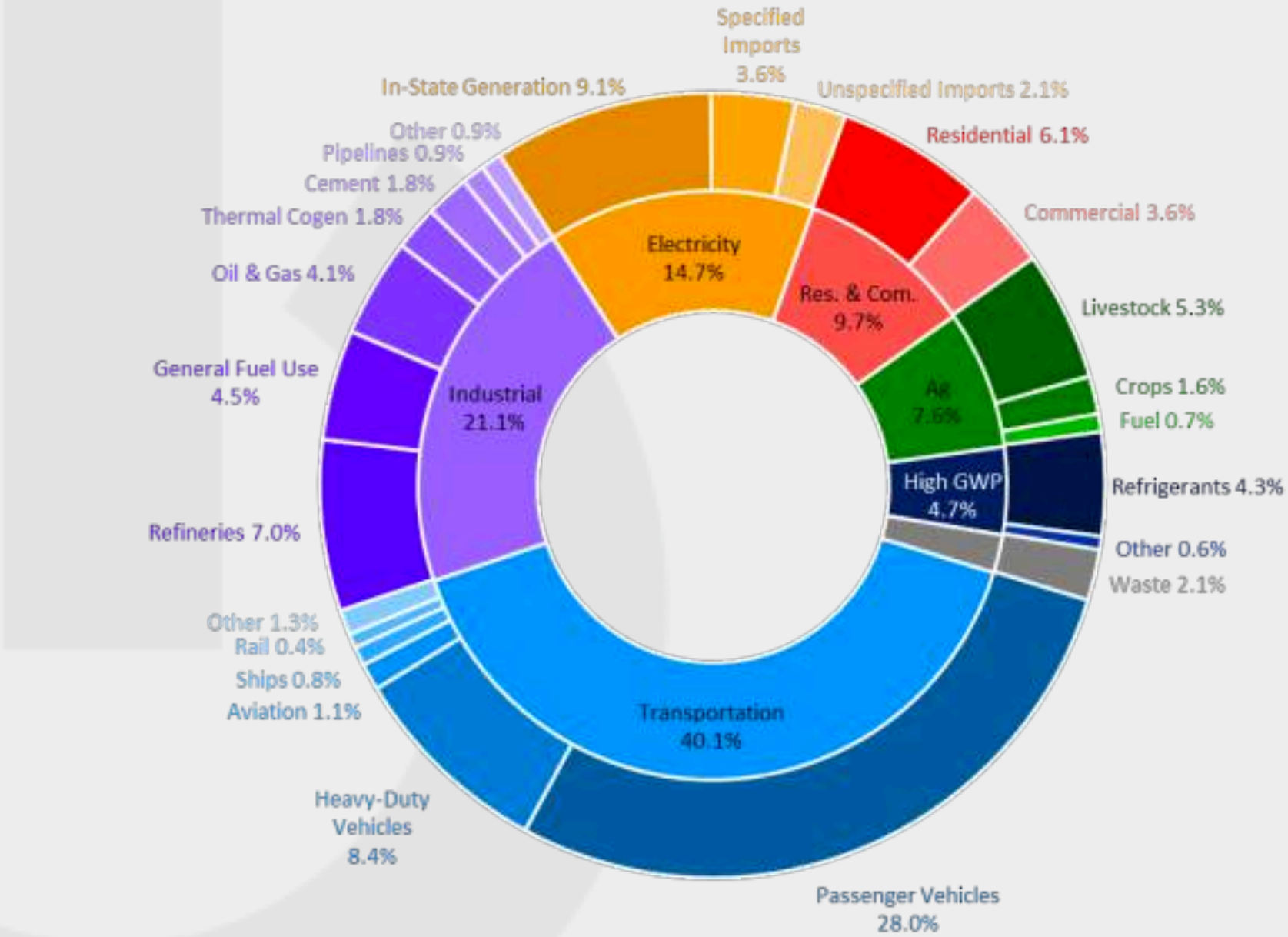
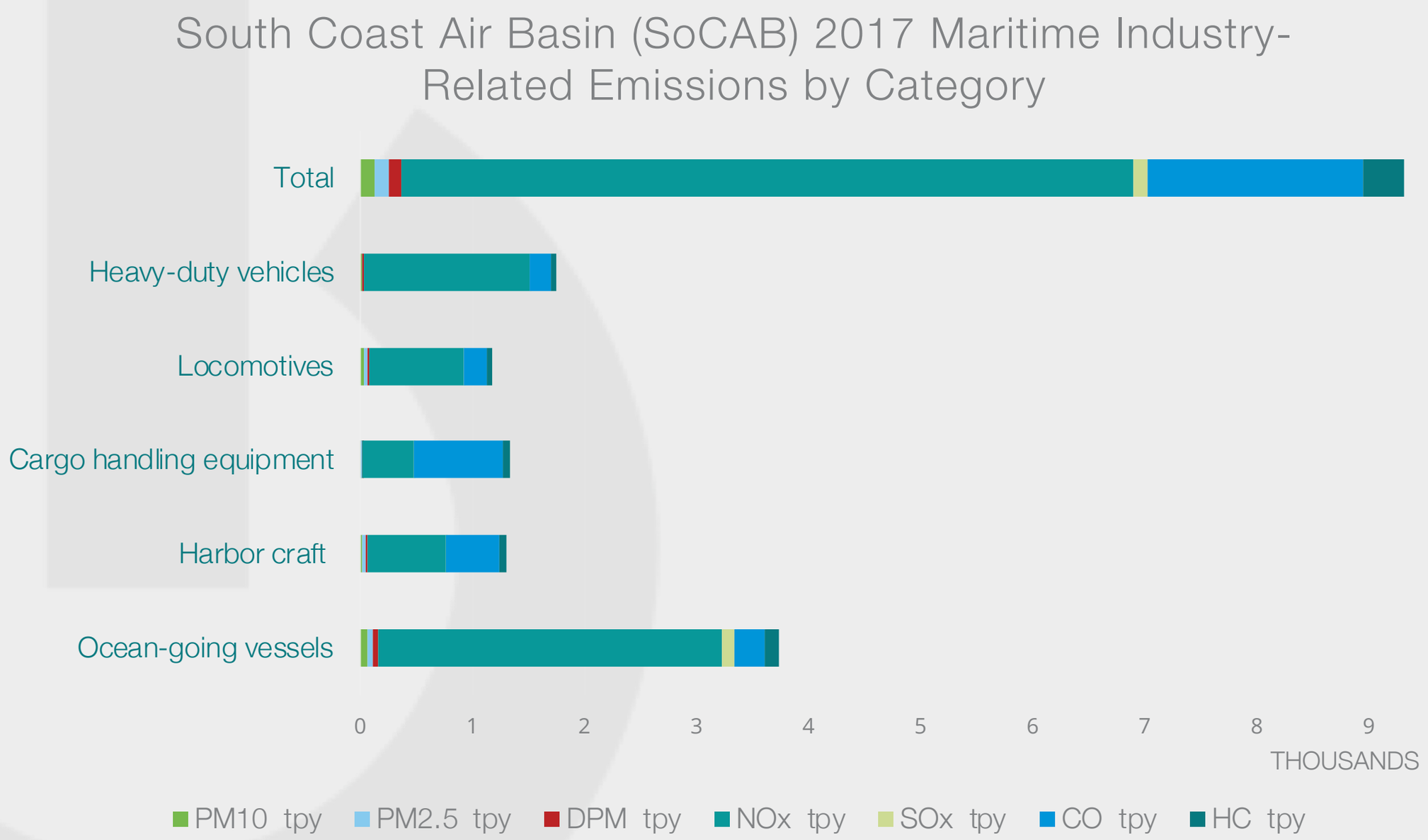
Emissions – State Perspective



Source: CARB 2017 GHG Emissions by Scoping Plan Sector and Sub-Sector Category

Emissions – SoCAB Perspective



Source: Port of Los Angeles 2017 Air Emissions Inventory

Sulfur Oxides SOx

97%

Diesel Particulate Matter DPM

93%

Nitrogen Oxides NOx

60%

Greenhouse Gases

31%

Despite the achievements, the greater LA area remains the most polluted region in the U.S. Also, the recent report from Next10 and Beacon Economics shows that if we keep the current pace, California will reach its 2030 AB 32 targets by 2061.

12%

TEUs

Emission Reduction in SPB

2019 AIR EMISSIONS INVENTORY COMPARED TO 2005 LEVELS

Photo: Kat Janowicz

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Electric and hydrogen fuel-cell vehicles produce zero tailpipe emissions.
Tailpipe emissions don't reflect emissions from generating energy and manufacturing or disposing of a car.
Photo: Max Lederer

Examples of Technology Solutions

Goal

CO2,
NOx, DPM

Strategy

ZE
Zero
Emission

NZE
Near Zero
Emission

ER
Emission
Reduction

Vehicle

Propulsion

H2
Hydrogen
Fuel Cell

Hybrid

LNG

CNG

Integration

Demand

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Project Examples

1 NZE
Near Zero Emission

Retrofit of tractors (Tier 3 and 4) at port terminals with stop-start technology. No infrastructure upgrades required. Bi-directional telemetry systems will collect operating parameters and remotely monitor each vehicle status and system performance.

2 ZE
Zero Emission

Combination of technologies. Upgrade to zero-emission railyard switcher battery electric locomotive with updated electronics, wireless power transfer charging stations and wayside battery storage system.

3 ER
Emission Reduction

The barge-based technology captures and eliminates emissions (SOx, NOx, and PM) from diesel auxiliary engines and auxiliary boilers of ships (ocean-going vessels) at berth and anchor. No vessel modifications are required. Alternative to shore power, aka cold ironing.

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Timeline

Infrastructure & Facilities

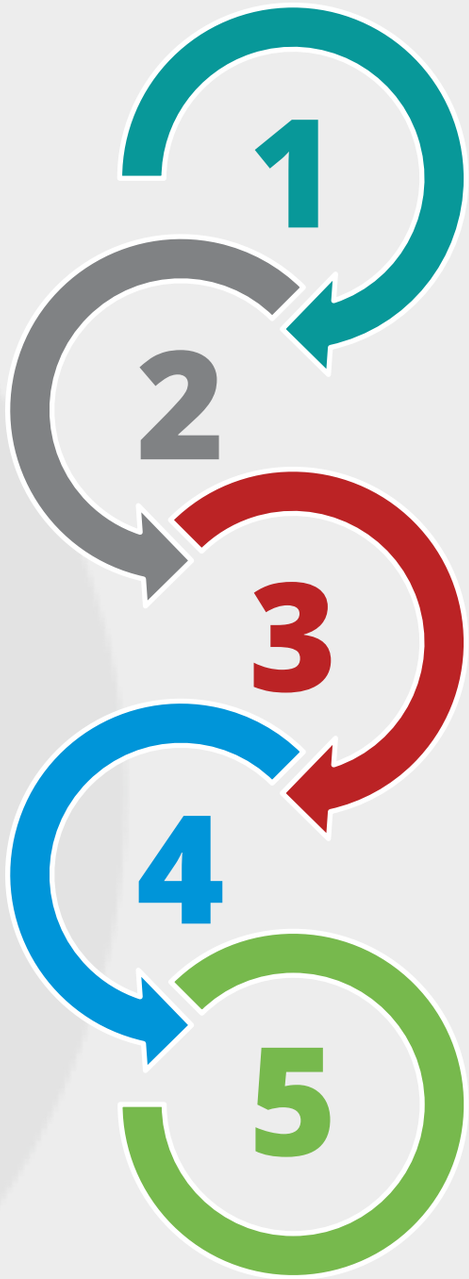
Modifications and upgrades to accommodate charging and fueling, electricity procurement, property acquisition, permitting

Duration: 6 months - 5 years

System Integration

Commissioning, testing, training

Duration: 1-9 months



Engineering & Design

Configuration, vehicle redesign, system layout, test plan, R&D

Duration: 3-12 months

Production & Delivery

Procurement, assembly drawings, manufacturing, bench-testing, bill of materials, constructability review

Duration: 1-8 months

In-Use Demonstration

Testing, performance tracking, data gathering, maintenance

Duration: 1 year (average)

Evaluation Criteria

TYPE OF TECHNOLOGY

Which technology will help achieve the goals? Steps to take

TECHNICAL AVAILABILITY

In-use demonstration, other applicability, standardization (power plugs)

COMMERCIAL AVAILABILITY

Potential to advance deployment, scalability, company readiness

INFRASTRUCTURE UPGRADES

Charging equipment, facility modifications, energy and utilities, property acquisition

OPERATIONS AND PERFORMANCE

Reliability, performance tracking, data collection, operations, preventive maintenance, warranty

TRAINING AND EDUCATION

Proper training, lessons learned, industry best practices: challenges, success stories

CERTIFICATION & COMPLIANCE

CARB certification, fuel quality, UL verification, emissions control, permits, registration

COST EFFECTIVENESS

Costs, funding options and availability, match funding, compared to the desired outcome

SUSTAINABILITY CONSIDERATIONS

Lifecycle approach, product sourcing, reuse, procurement, resilience, emissions reduction, manufacturing

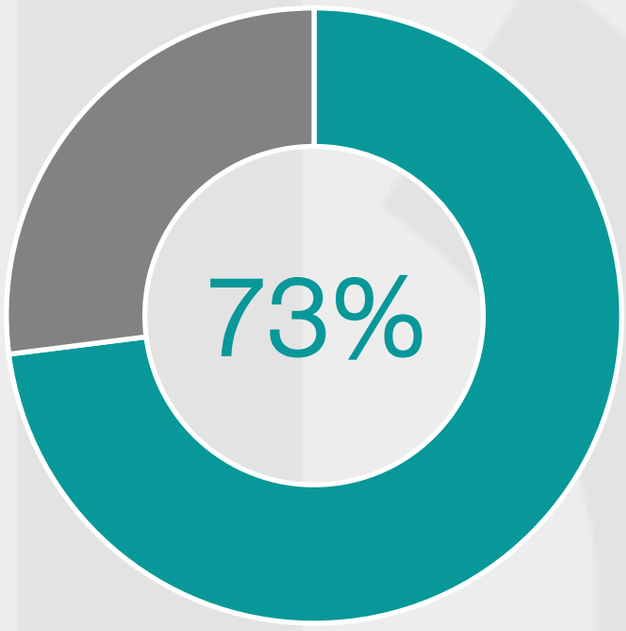
ECONOMIC DEVELOPMENT

Competitiveness, trade policy and other risks, jobs created, sustained, local small business and project partners secured

Types of Risk

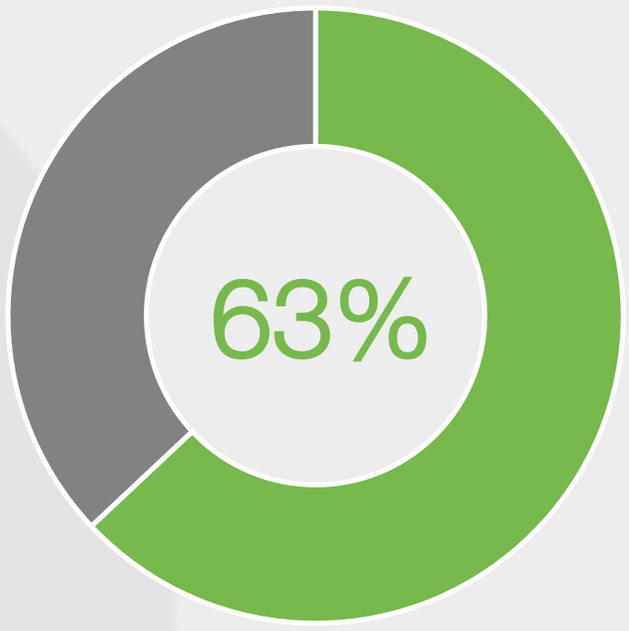
Non-Technical Risk

Political or stakeholder-related

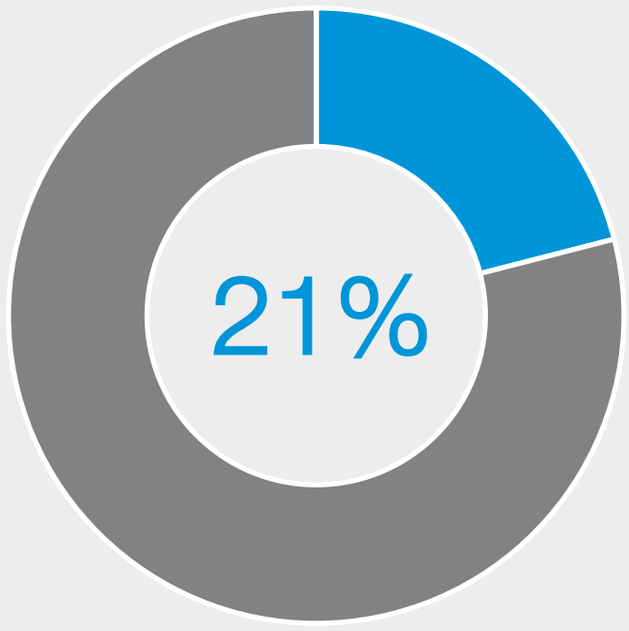


Commercial Risk

Cost or contract-related



Technical Risk



AVERAGE DELAY: 12 MONTHS

- Other risks: legal, compliance, strategic, financial reporting
- Preventable, strategic, and uncontrollable external risks

Data: Goldman Sachs Global Investment Research "190 Projects to Change the World", Oil & Gas 2008

UNINTENDED CONSEQUENCES

PERVERSE RESULT

Intended solution
that made a problem worse

UNEXPECTED DRAWBACK

Negative outcome
in addition to desired effect

UNEXPECTED BENEFIT

Positive unexpected
or unpredictable outcome

Photo: Mohan Moolepetlu

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Decision-Making Elements

PROBLEM

What is the problem? How likely will the proposed technology or innovative approach solve this problem?

ALTERNATIVES

What are the feasible alternatives? What are the pros and cons of each? What are the risks associated with each of them? Which scenario would work best?

UNCERTAINTY

What are the significant uncertainties? What are the possible outcomes of these uncertainties? How will this decision address them?

LINKED DECISIONS

How will this decision affect other people, organizations, partners, community (industry, country or world)?

CONTEXT AND OBJECTIVES

Will this decision take into account the complexity, boundaries and stakeholders? Will it allow to stay focused on the main goal?

RISK AND RISK TOLERANCE

What are consequences and probabilities of their occurrence for identified risks? What is the acceptable risk tolerance?

CONSEQUENCES

What are the intended consequences? What are the viable unintended consequences? How can the negative outcomes be possibly turned into opportunities?

TRADE-OFFS

What kind of trade-offs will this decision require? Which of them can be acceptable? How will they effect the outcome?

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Recognize Bias

BEHAVIORAL, COGNITIVE, DECISION-MAKING, EMOTIONAL, SOCIAL

The first test seemed ok. Do we need to perform any more?

ANCHORING EFFECT

Everybody in the organization agrees that there is no issue here.

BANDWAGON EFFECT

I like this tool. I can't believe that they offered so little for it. It's definitely worth more.

ENDOWMENT EFFECT

Photo: Oscar Keys

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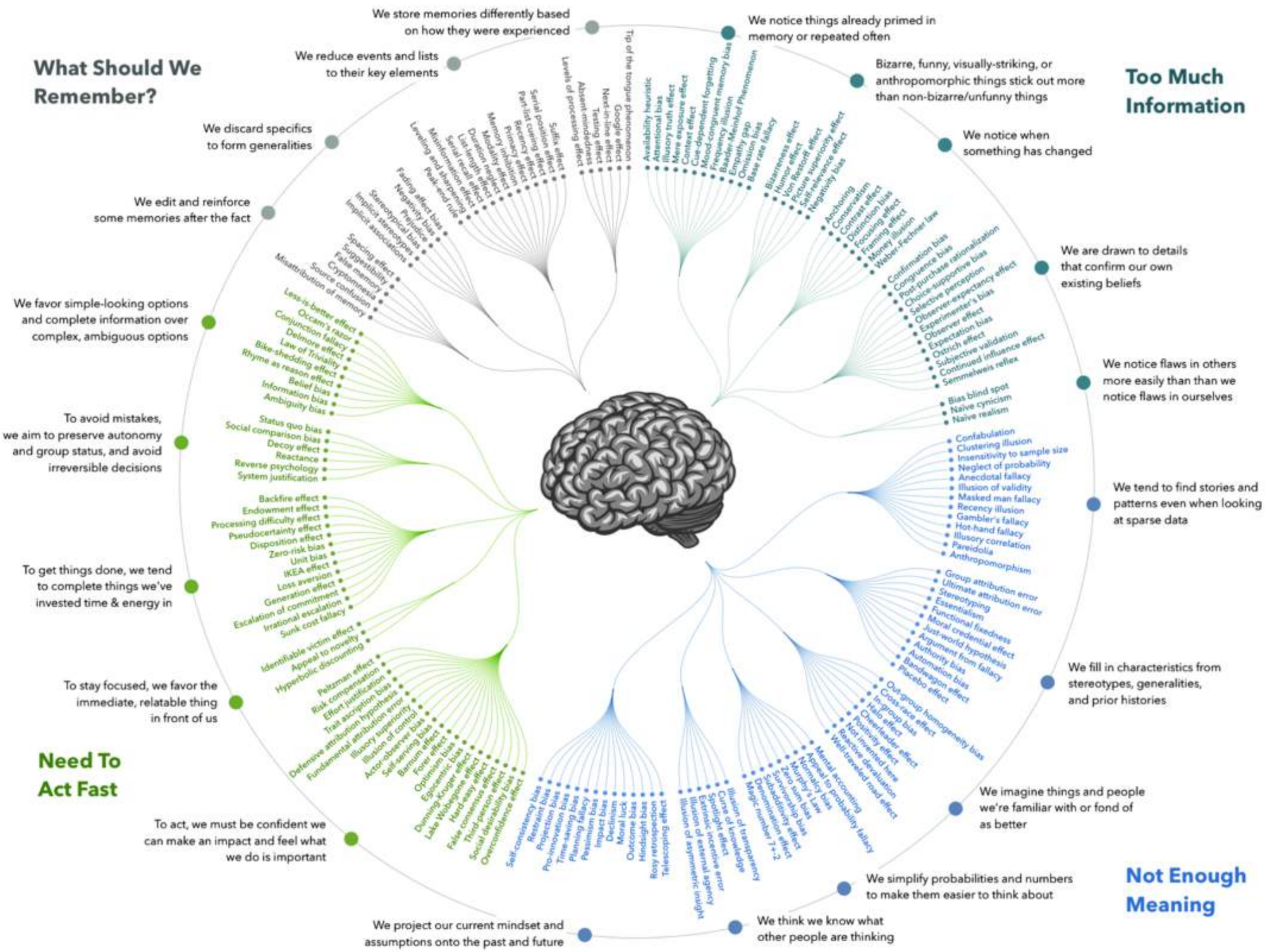
COGNITIVE BIAS CODEX



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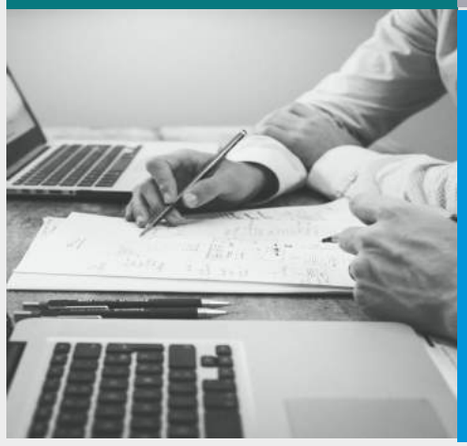
Key Takeaways

Keep your eye on the goal

Identify criteria, assumptions, and trade-offs

Do the right thing for the right reason



Understand the context

Assess risks and remain open-minded

Thank you

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Photo: Bobby Kasimis