Land Transport S&T Roadmap
Approach in the Development of the Land Transport S&T Roadmap
Land Transport S&T Roadmap

Alignment to S&T Priority Programs

Discussions with RDI’s (Scientists)

Discussion with Industry (Manufacturers/Suppliers)

Satisfy Societal Needs

Alignment to DOTC’s Transport Program

Alignment to PDP 2011-2016

Alignment to PNoy’s KRAs

Literature Analysis (Best Practices)
DOST Programs in line with Pnoy’s KRAs

- Rapid, Inclusive and Sustained Economic Growth
- Integrity of the Environment and Climate Change Adaptation and Mitigation
- Poverty Reduction and Empowerment of the Poor and Vulnerable
National Harmonized R&D Agenda for 2013-2017

- Poverty Alleviation and Inclusive Growth
Competitive Industries

- Transport

Modern and cost-effective mass transport systems through enhanced design, manufacturing, supply infrastructure, and support capabilities
Improved Delivery of Social Services

- Traffic/Mobility

Improved mobility of people and goods through efficient and intelligent transport systems
DOST OUTCOME 6: Improved quality healthcare and quality of life thru science, technology and innovation.
Land Transport S&T Roadmap

Goal: Integrated, responsive, effective, efficient and safe transport systems by 2020

Scope:

1. **Road Transport**
   - E-vehicle Parts and components
   - PUJ design improvement
   - Bus design enhancement - Centrally powered hybrid electric road train
   - Road infrastructures

2. **Rail Transport**
   - Automated Guideway Transit
   - Railway Systems

3. **Intelligent Transport System (ITS)**
   - Advanced Traffic Management System
   - Advanced Traveller Information System

4. **Automotive R&D Parts & Components and Testing Facility**
   - Localization of Parts and Components
   - Establishment of international compliant testing facilities
DOST Outcome 6

Road Strategies

**EV**

Develop EV Parts and Components Standards
- Battery Management System
- Body Structure
- Drive Gear System
- Battery Storage System

Roll-out optimized fast charging stations with BMS through integrated network system

Fabricate hybrid electric PUVs with light body architecture

Establish solar fast charging stations

Establish E-payment scheme for EV charging stations

Outcome

Improved fuel mileage of vehicles and reduce emissions

Advanced transport system with less intrusive infrastructures
DOST Outcome 6
Road

**Strategies**

**PUJ**
Develop lightweight body architecture of a conventional 22-seater PUJs

Fabricate hybrid PUJ with regenerative braking system

**Outcome**

Optimized fuel economy of urban passenger mass transport

Improved fuel mileage of vehicles and reduce emissions
DOST Outcome 6
Road

**Strategies**

**BUS**
- Demonstrate the centrally powered hybrid electric road train (CRT)
- Develop a prototype diesel-electric parallel series hybrid vehicle
- Develop standards for design improve of buses
- Establish bus performance standards, i.e. “black box”, speed limiters, GPS and video detectors

**Outcome**
- Advanced transport system with less intrusive infrastructures
- Optimized fuel economy of urban passenger mass transport
- Improve safety and comfort level
DOST Outcome 6
Rail

Strategies

- Develop commercial AGT prototype
- Optimize design and system efficiency of existing train components
- Retrofit, design and localize system components
- Automated signaling system
- Develop origin-destination and demand forecasting tools
- Establish automatic passenger counting, demand and scheduling system
- Establish automatic train safety control system

Outcome

- Advanced transport system with less intrusive infrastructures
- Improved safety and comfort level
DOST Outcome 6
ITS

Strategies

Establish passenger count with origin destination & route demand forecasting

Develop and fabricate on-board console for automatic control signaling system

Develop web based air pollution & traffic monitoring system and prediction models

Deploy locally developed advanced traveler information systems

Develop traffic modeling and forecasting tools

Outcome

Smart inter-modal transport for better connectivity

Improved urban mobility and accessibility & reliability of transport schedules
DOST Outcome 6
S&T Support Services

Strategies

Enhance Automotive Parts & components Testing Facility

Establish Performance Testing and fuel efficiency analysis protocol for improved PUJs and Hybrid EVs

Establish criteria and characterization categories of public roads, i.e. flatness and distance conducive for different mass transport system

Outcome

International compliant testing facilities and standards

Improve safety and comfort level
GOAL: Integrated, responsive, effective, efficient and safe transport systems

S&T Outcomes

1. Improve safety and comfort level
   - Optimized fuel economy of urban passenger mass transport

2. Improved fuel mileage of vehicles and reduce emissions
   - Advanced transport system with less intrusive infrastructures

3. Advanced transport system
   - Improved fuel economy of urban passenger mass transport

S&T Strategies

- 2014 - 2016
  - Develop EV Parts and Components Standards
  - Fabricate hybrid PUJ with regenerative braking system
  - Develop a prototype diesel-electric parallel series hybrid vehicle
  - Develop lightweight body architecture of a conventional 22-seater PUJs

- 2017 - 2020
  - Establish on-board bus performance standards, i.e. “black box, speed limiters, GPS and video detectors
  - Establish solar fast charging stations
  - Establish E-payment scheme for EV charging station
  - Fabricate hybrid electric PUVs with light body architecture
  - Roll-out optimized & cost reduced fast charging stations with BMS through integrated network system

- 2017 - 2020
  - Develop standards for design improvement of buses
GOAL: Integrated, responsive, effective, efficient and safe transport systems

S&T Outcomes

Smart inter-modal transport for better connectivity

Improved urban mobility and accessibility and reliability of transport schedules

2014 - 2016

- Develop and fabricate on-board console for automatic control signaling system
- Establish passenger count with origin destination & route demand forecasting

2017 - 2020

- Roll-out of local traffic modeling and forecasting tools
- Develop traffic modeling and forecasting tools
- Deploy locally developed advanced traveler information systems
- Develop web based air pollution and traffic monitoring system and prediction models

S&T Strategies
Land Transport S&T Roadmap – S&T support Services

GOAL: Integrated, responsive, effective, efficient and safe transport systems

S&T Outcomes

- Improve safety and comfort level
- Optimized fuel economy of urban passenger mass transport
- International compliant testing facilities and standards

S&T Strategies

- Establish Performance Testing and fuel efficiency analysis protocol for improved PUJs and Hybrid EVs
- Enhance Automotive Parts & components Testing Facility
- Establish criteria and characterization categories of public roads, i.e. flatness and distance conducive for different mass transport system
Sea/Water Transport S&T Roadmap
Approach in the Development of the Sea/Water Transport S&T Roadmap
Sea/Water Transport S&T Roadmap

Alignment to S&T Priority Programs

Discussion with RDI's (Scientists)

Discussion with Industry (Manufacturers/Suppliers)

Satisfy Societal Needs

Alignment to DOTC's Transport Program

Alignment to PDP 2011-2016

Alignment to PNoy's KRAs

Literature Analysis (Best Practices)
DOST Outcome 6

Strategies

Development of Design Guidelines (right sizing of hull, engine, propulsion and materials) for fishing and passenger vessel

Assess the local fiberglass industry and support industry for vessel construction using local alternative materials

Assess the existing fishing and passenger vessel making sector

Prototype development of fishing and passenger vessels for bay/river and open sea

Outcome

Alternative material for fishing and passenger vessel
DOST Outcome 6

**Strategies**

- Develop appraisal system tool for seaworthy compliant per IMO standards
- Navigational simulation tool
- Engine and machinery performance diagnostic tool
- Develop Local Maritime Transportation Simulation Models
- Develop Voyage data recording system

**Outcome**

IMO compliant sea crafts
DOST Outcome 6

**Strategies**

- Assess inter-connectivity of freight and passenger multi-modal transport system
- Develop integrated data recording and archiving system

**Outcome**

Multi-modal (sea, land, rail) transport systems
Sea/Water Transport S&T Roadmap

GOAL:
Safer, cleaner and efficient maritime transport systems and services

S&T Outcomes

- Multi-modal (sea, land, rail) transport systems
- IMO compliant sea crafts
- Alternative material for fishing and passenger vessel

S&T Strategies

- Development of Design Guidelines (right sizing of hull, engine, propulsion & materials) for fishing and passenger vessel
- Assess the local fiberglass industry and support industry for vessel construction using local alternative materials
- Assess the existing fishing and passenger vessel making sector
- Prototype development of fishing and passenger vessels for bay/river and open sea
- Develop appraisal system tool for sea worthy compliant per IMO standards
- Develop navigational simulation tool
- Develop local maritime transportation simulation models
- Develop integrated data recording and archiving system
- Assess inter-connectivity of freight and passenger multi-modal transport systems
- Engine and machinery performance diagnostic tool
- Develop local maritime transportation simulation models
## LAND TRANSPORT R&D ROADMAP

<table>
<thead>
<tr>
<th>Priorities</th>
<th>Research Domain</th>
<th>Specific Activities</th>
<th>Timeframe</th>
<th>Expected Output</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>E-Vehicle Parts and Components</td>
<td>Fast Charging Systems</td>
<td>2013 - 2015</td>
<td>Efficient and Low-cost power electronics locally developed</td>
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<td></td>
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<td>Study on Battery Cell Degradation</td>
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<td>Increased Societal Awareness on EV (Operability and utilization)</td>
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<td></td>
<td>Optimization of Battery Packs</td>
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<td>First Fast Charging Station Locally Established</td>
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<td>Optimize system efficiency with existing components</td>
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<td>E-payment Scheme Developed (for the charging scheme)</td>
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<td></td>
<td>Explore lightweight materials, eco-design, recycling</td>
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<td>EV Parts and Components Increased</td>
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<td>Design Electrical Architecture and Interconnects</td>
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<td>Technology Provider on Regenerative Braking System</td>
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<td>Create Systems for information on Change Status</td>
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<td>EV Charging Stations on selected cities and public highways established</td>
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<td></td>
<td>Create Business Models for Charging</td>
<td>2013 - 2016</td>
<td>Policy/Regulations on EVs (Charging, etc.) Established</td>
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<td></td>
<td>• Battery Swapping</td>
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<td>EVs Integrated in the transport System</td>
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<td>• E-payment scheme for EV charging stations</td>
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<td>Establishment of Infrastructure</td>
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<td></td>
<td>Roll-out optimized fast charging stations with BMS through integrated network system</td>
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<td></td>
<td></td>
<td>Develop EV Parts and Components Standards</td>
<td>2013 - 2019</td>
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<td></td>
<td>• Battery Management System</td>
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<td>• Body Structure</td>
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<td>• Drive Gear System</td>
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<td>• Battery Storage System</td>
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<td>PRIORITY</td>
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</tr>
<tr>
<td>SUSTAINABLE MASS TRANSPORT SYSTEM - ROAD</td>
<td>PUJ Design Improvement - Vehicle Chassis System and Components</td>
<td>Conduct of finite element analysis (FEA) for CLRV parts</td>
<td>2013-2015</td>
<td>Standards Developed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Explore Light-weight Materials, eco-design and recycling</td>
<td></td>
<td>Braking Energy Storage Developed and Pilot tested</td>
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<tr>
<td></td>
<td></td>
<td>Develop CLRV Standards on parts and components</td>
<td></td>
<td>Lightweight Alternative Materials Explored</td>
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<td>Develop E-jeepney with regenerative braking system</td>
<td></td>
<td>Local Capability for Conversion (Hybrid) Developed</td>
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<td></td>
<td></td>
<td>Develop and Assess Hybrid- vehicle (E-jeepney, E-bus)</td>
<td></td>
<td>Developed lightweight body architecture of a conventional 22-seater PUJs</td>
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<tr>
<td></td>
<td>BUS Design Enhancement - Centrally powered hybrid vehicles</td>
<td>Demonstrate the centrally powered hybrid electric road train (CRT)</td>
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<td>Develop a prototype diesel-electric parallel series hybrid vehicle</td>
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<td>Establish bus performance standards, i.e. “black box”, speed limiters, GPS and video detectors</td>
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## LAND TRANSPORT R&D ROADMAP

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<tr>
<td></td>
<td>AGT</td>
<td>Optimize design and system efficiency</td>
<td>2013-2015</td>
<td>Design and Efficiency Optimization Completed (30 – 120 seater)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Develop commercial prototype</td>
<td>2016-2020</td>
<td>Commercial Operation</td>
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<td>Automated signaling system</td>
<td>2016-2020</td>
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<td>Develop safety standards and certification</td>
<td>2017-2020</td>
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<tr>
<td></td>
<td>Railway System</td>
<td>Retrofitting Design and Localization of System Components</td>
<td>2018-2020</td>
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<td>Develop commercial prototype</td>
<td>2019-2020</td>
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<td></td>
<td>Automated Systems - Develop origin-destination and demand forecasting tools</td>
<td>2020</td>
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<td></td>
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<td>- Establish automatic passenger counting, demand and scheduling system</td>
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<td>- Establish automatic train safety control system</td>
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### SUSTAINABLE MASS TRANSPORT SYSTEM - RAIL

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<tr>
<td></td>
<td></td>
<td>Roll-out Program for PhilMATIS</td>
<td></td>
<td>Developed Local Traffic Simulator</td>
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<tr>
<td></td>
<td>Advance Traffic Management System (ATMS)</td>
<td>Develop web based air pollution &amp; traffic monitoring system and prediction models</td>
<td></td>
<td>ATMS and APS Prototype System Developed</td>
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<tr>
<td></td>
<td></td>
<td>Establish passenger count with origin destination &amp; route demand forecasting</td>
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<td>Increased Societal Awareness on ITS</td>
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<td></td>
<td>Develop traffic modeling and forecasting tools</td>
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<td>Deployed locally developed advanced traveler information systems</td>
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<td>Roll-out Program for ATMS</td>
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<td>Pilot Smart Cities / Smart inter-modal transport for better connectivity</td>
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<td>Transport Intermodal</td>
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<td></td>
<td>Roll-out of local traffic modeling and forecasting tools</td>
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<tr>
<td></td>
<td></td>
<td>Establishment of international compliant testing facilities</td>
<td></td>
<td>Developed of a 12 hp single cylinder diesel engine</td>
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<td>Localization of Parts and Components</td>
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<td>Improved safety and</td>
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<td></td>
<td>Gear Making and Assembly Facility</td>
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<tr>
<td>RT SYSTEM – R&amp;D for Transportation parts and components</td>
<td>Establish Performance Testing and fuel efficiency analysis protocol for improved PUJs and Hybrid EVs</td>
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<tr>
<td>SUSTAINABLE MASS TRANSPORT SYSTEM - Safer, cleaner and efficient maritime transport systems and services</td>
<td>Alternative material for fishing and passenger vessel</td>
<td>Development of Design Guidelines (right sizing of hull, engine, propulsion &amp; materials) for fishing and passenger vessel</td>
<td>2014 - 2016</td>
<td>Cost-effective sea-worthy hull design using alternative lightweight materials for passenger and fishing vessels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assess the local fiberglass industry and support industry for vessel construction using local alternative materials</td>
<td>2017 - 2020</td>
<td>IMO compliant sea crafts</td>
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<tr>
<td></td>
<td></td>
<td>Assess the existing fishing and passenger vessel making sector</td>
<td></td>
<td>Pilot Smart Cities / Smart inter-modal transport for better connectivity (sea, land and rail transport systems)</td>
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<td>Prototype development of fishing and passenger vessels for bay/river and open sea</td>
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<tr>
<td>Multi-modal (sea, land, rail) transport systems</td>
<td>Integrated ITS - Navigational simulation tool - Engine and machinery performance diagnostic tool - Develop Local Maritime Transportation Simulation Models - Develop Local Maritime Transportation Simulation Models</td>
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<td>Assess inter-connectivity of freight and passenger multi-modal transport system</td>
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<td>Develop integrated data recording and archiving system</td>
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