

gTKP global Transport Knowledge Partnership

Transport Power Points:
10-minute briefing series

Intermediate Equipment for Road works and Small & Medium Enterprises

Rural Transport

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Rationale - Available Resources

Typical features

Developed countries: wage rate >US\$100/day and credit finance rates <10%pa
This suggests capital intensive, labour saving approaches are most appropriate in those countries

Emerging Countries: wage rate <US\$10/day and credit finance rates >20%pa (if available)
This suggests Low-Capital, Low-cost equipment, labour & local materials approaches are most appropriate:
→ → Local Resource Based Technology

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What is 'Heavy Equipment'?

Sophisticated civil engineering equipment designed for, and generally manufactured in, high-wage, low-investment-charge economies.

Expected to operate with close support and high annual utilisation. Usually designed for a single function with high efficiency operation.

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Heavy Equipment Problems in Developing Countries - 1

Operational:

- Dedicated function (can only be used for one operation)
- Inter-dependence (e.g. dozer, loader, trucks, motorgrader, bowser, roller all required for gravelling – what happens when ONE link in the chain breaks down?)
- Lack of continuity of workload for plant items of dedicated function
- Usually based at locations remote from worksites – plant transporters required and long mobilization/demobilization distances involved

Technical:

- High pressure hydraulic and electronic systems
- Sophisticated mechanisms and hydraulics
- Disposable components; difficult to repair or refurbish

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Heavy Equipment Problems - 2

Local Support and Equipment Maintenance:

- Limited local market for equipment sales of each model
- Specialist repair and maintenance skills, tools and facilities required (often only available in the capital city)
- Few dealers able to provide the necessary close support
- Long spares supply lines and delivery times
- Frequent model "improvements" causing spares stocking, procurement problems and obsolescence

Cost:

- All equipment and spares imported – consuming scarce foreign exchange
- High capital and finance costs
- High costs of stocking and provision of spares

TYPICAL RESULT - low availability & high overall costs!

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What is 'Intermediate Equipment'?

Simple or intermediate equipment designed for low initial and operating costs, durability and ease of maintenance and repair in the conditions typical of a **limited-resource environment**, rather than for high theoretical efficiency.

It is preferable if the equipment can also be **manufactured or fabricated locally**.

Agricultural Tractors are a versatile example - can be used for a range of tasks with locally fabricated attachments.

Locally manufactured small trucks are available in Asia

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The Versatile 2 axle Agricultural Tractor

- **Agricultural Tractors are the simplest and cheapest mobile flexible power source**
- **There are many road works applications for tractors that can boost cross-sector utilization and profitability for owners outside of traditional agricultural applications**
- **Local fabrication of tractor attachments creates local employment and support capacity**

Road Sector - Agricultural Tractor Applications

ROAD TASK	ATTACHMENT	ROAD TASK	ATTACHMENT
Gravel Haulage	Trailer	Excavation	Back hoe/ripper /scarifier/compressor & pneumatic tools
Water Haulage	Bowser	Loading	Front shovel/backhoe
Personnel Transport	Trailer		Towed mower
Bridge/Culvert Materials Transport	Trailer		Blade/loader/grader
Fuel Haulage	Fuel Bowser		Towed/attached heater/sprayer
Plant Haulage	Low Loader	Stone crushing	Crusher & screens
Towed Grading	Heavy/Light Towed Grader	Chippings transport	Trailer
Dragging	Towed Drag	Recycling Pavement	Milling attachment
		Brushing/sweeping	Mechanical broom
Compaction	Towed rubber/steel deadweight/vibrating Roller	Mixing	Disc harrow/rotovator
		Slurry Sealing	Mixer and spreader
Earthworks excavation & haulage	Towed Scraper	Premix patching	Pre-mixer
		Accommodation	Caravan
		Workshop	Caravan

Most road tasks have a choice of technology

E.G. CONSTRUCTION OF NEW ROAD BASE LAYER FROM EXISTING BASE & BITUMINOUS SURFACING

TECHNOLOGY OPTIONS FOR EACH OPERATION; TRACTOR OPTIONS SHOWN EMBOLDENED & HIGHLIGHTED					
1. BREAK UP EXISTING PAVEMENT	2. BREAK DOWN PAVEMENT MATERIAL TO ACCEPTABLE SIZE	3. APPLY BITUMEN EMULSION	4. MIX EMULSION & RECYCLED PAVEMENT MATERIALS	5. SHAPE MIXED MATERIAL TO FORM NEW ROAD BASE LAYER	6. ROLL ROAD BASE LAYER
Labour with picks, mattocks, sledgehammers, crowbars, shovels	Labour with sledgehammers, stone hammers and steel mesh	Labour using fixed volume containers per unit area	Wheeled tractor with heavy duty disc harrow	Labour with rakes and shovels	Labour with twin drum pedestrian vibrating roller
Labour with compressor and breaker tools	Wheeled tractor with adapted towed roller	Labour with one barrel hand lance	Wheeled tractor with rediprocating harrow	Wheeled tractor with heavy towed grader	Wheeled tractor with towed deadweight roller
Wheeled tractor with ripper attachment	Wheeled tractor with pulverising / milling attachment	Wheeled tractor with towed/ attached bitumen distributor	Wheeled tractor with heavy towed grader	Motor grader	Wheeled tractor with towed vibrating roller
Wheeled tractor with pulverising / milling attachment	Self propelled pulverising /milling equipment	Truck mounted distributor	Motor grader		Self propelled deadweight roller
Tracked tractor with ripper attachment					Self propelled vibrating roller
Self propelled milling attachment					

Source: Agricultural Tractors in Road works

INTERMEDIATE EQUIPMENT SUB-SECTOR NEEDS

- **Awareness** creation concerning availability and performance (Leaders-agencies-media-private sector)
- **Real Cost-awareness** regarding all equipment (& particularly intermediate equipment)
- **Stable, specific & diversified Market** for contractors
- **Designs and specifications** for procurement
- **Procurement** guidelines
- **Management and support** guidelines
- **Training-Demonstration** & skill accreditation
- Availability of **finance**
- Availability for **hire**
- **Dissemination** & mainstreaming of Knowledge

Source: based on Agricultural Tractors in Roadworks

Further Information

global Transport Knowledge Partnership:
www.gtkp.com

- **Website and free access to knowledge**
- **Monthly Newsletter**
- **Free Technical Enquiry Service**

Further information may be obtained from the above website and the gTKP Rural Transport Theme Champion: rob.petts@gtkp.com

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