Logistics and Land: the Changing Land Use Requirements of Logistical Activity

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LRN 2009 Conference
Cardiff Business School
10th September 2009
Government Foresight Programme

‘Land Use Futures’

‘To explore how land use in the UK could change over the next 50 years…examining society’s future needs and values towards land use.’

Outline

Classify of logistics-related land uses
Examine the recent growth of warehousing in UK
Review GVA-based forecasts of future warehouse growth trends
Consider of other factors likely to affect this trend
Present a model for assessing future logistics land requirements
Classification of Land Requirements by Logistical Activity

Plot ratio = building floor area : total site area

151 million square metres in England and Wales (2006)
45% plot ratio → 23,500 hectares
1% of non-agricultural and non-forestry land
Britain has evolved from ‘workshop of the world’ to the ‘warehouse of the world’ ‘..mushrooming acreage of mega-sheds and depot centres undermining civic life and our manufacturing base’. ‘….the liberalisation of world trade and the influx of manufactured goods from India and China mean that Britain has no option but to erect ever larger warehouses’. (Hunt, 2006)
Growth of Warehouse Floorspace

- 2.4% growth between 1998 and 2004 – in line with GDP
- complex underlying relationship
- total value of inventory in UK economy has remained fairly stable
- ratio of inventory to GDP has steadily dropped

Source: Dept for Transport ‘Focus on Freight, 2007)
Changing Ratio of Warehouse Floorspace to Value of Inventory

Possible reasons

• Value density of the inventory is increasing
• Inventory is also stored in other types of building (shops, factories etc)
• Warehouse floorspace is a 2-dimensional measure: *average height of warehouses is increasing storage capacity per square metre*
• Amount of vacant warehousing varies through time: *in relation to economic activity and the property cycle.*
• Warehouse space used for purposes other than storage: *change in the nature and range of activities performed in warehouses*
New Floorspace in Distribution Centres of over 10,000 square metres

Increase in average size of DCs of over 10,000 sq m

Source: King Sturge, 2009
Take-up of Large New DCs by Type of Organisation

Source: King Sturge
Forecasting Future Demand for Warehouse Land

Assumptions:

- Close correlation between Gross Value Added (GVA) and warehouse floorspace (past correlations: UK $r = 0.94$ London $r = 0.96$)
- GVA growth rate of 2.5-3%
- Stable plot ratios - around 45%

Projected growth in demand for warehouse land in London

Source: URS Corporation, 2006
Factors Likely to Distort the GVA – Warehouse Land Relationship

Off-shoring of manufacturing and upstream supply chains

Increase in the relative costs of freight transport, inventory and warehousing

Transfer of freight to more environmentally sustainable transport modes

Growth of online retailing

Advances in warehouse technology

Restructuring of the waste supply chain

Adaptation of logistics systems to the effects of climate change
Off-shoring of Manufacturing and Upstream Supply Chains

Some off-shoring of warehousing to more central European locations

Companies interested in developing DCs in particular Western European Countries

- **Netherlands**: 32%
- **Germany**: 23%
- **Spain**: 13%
- **Belgium**: 13%
- **France**: 13%
- **UK**: 14%
- **Italy**: 9%
- **Sweden**: 7%
- **Austria**: 2%
- **Denmark**: 2%
- **Ireland**: 2%
- **Finland**: 4%
- **Switzerland**: 2%
- **Norway**: 2%
- **Luxembourg**: 2%
- **Portugal**: 0%

Source: Capgemini / Prologis, 2006

port-centric logistics
Prospects of return to more decentralised warehousing likely to be limited

Modelling + company experience suggests that logistics trade-offs will be robust

Expansion of local transhipment operations relieves decentralisation pressures

Higher energy costs will promote modal shift to rail and water
Transfer of Freight to more Environmentally-sustainable Transport Modes

‘...the challenge for the future is to integrate the land use and transport planning systems in order to continue to rework the freight railway into the country’s industrial and commercial fabric.’ (Haywood, 1999)

Forecasts of railfreight growth:

Network Rail: 26-28% increase in tonne-km between 2006 and 2015

FTA / RFG: 30% growth between 2006 and 2015 - doubling by 2030
intermodal – doubling by 2015 - 5-fold increase by 2030

Conversion of rail-side brownfield land to non-freight-related uses

**New rail-connected property development:**

- Basic intermodal terminal
- Rail-served distribution parks
- Multi-modal logistics hubs: Güterverkehrszentrum
  Interporti
Growth of Online Retailing

Online retail sales growing roughly 13 times faster than conventional retail sales

Increased demand for:
- DCs for online retailers and their logistics providers
- Local fulfilment centres (only 2 so far for grocery online retailing)
- Capacity in parcel hub / satellite networks
- Collection points for online orders: existing premises or new build
Advances in Warehouse Technology

Increasing the intensity with which warehouse land is used:
- stacking product to a greater height
- greater mechanisation and automation
- Improved warehouse management systems

Reduction in the plot ratio: (i.e. surrounding land required)
- some new DCs with plot ratios of 25-25%.
- increased throughput per 1000 sq.m – increased traffic generation
- need for larger yards around DCs for parking / manoeuvring
- land for outdoor storage of waste / material for recycling

Eco-template warehouse
Restructuring the Waste Supply Chain

Less land required for land-fill sites

Growth in land required for:
- Storage of materials for recycling / reuse
- Waste reprocessing centres
- Resource recovery units at DC
Adaptation of Logistics Systems to Climate Change

- Relocation of DCs from areas of high flood risk
- Rerouting of vulnerable transport infrastructure
- Construction of flood defences and new settlements will require extraction, movement and storage of vast amounts of building material
- Decarbonisation of electricity supply will alter land-use pattern

**Graph:**

- **x-axis:** Year (2006, 2010, 2020, 2030, 2050)
- **y-axis:** gCO2 per kWh

**Source:** Committee on Climate Change, 2008

**Map:**

- **Legend:**
  - Blue: Potential extent of flooding in areas predicted to be at risk
  - Green: Most at risk from tidal flooding/history of flooding (Environment Agency)
  - Brown: At risk of serious flooding (Science Media Centre)

**Image:**

- Wind turbines and power station

**Source:** Environment Agency/Science Media Centre.
Effect of Economic Trends and Policy Decisions on the Land Requirements of Logistical Activity

1. Economic Trends
   - Off-shoring of manufacturing / import penetration
   - Composition of economic activity
   - Economic growth
   - Cost, prices and interest rates

2. Logistical Intensity of UK Economy
   - Material production / consumption
   - Stockturn rate
   - Degree of inventory centralisation

3. Logistics Technology / Warehouse Design
   - Physical inventory
   - Storage space

4. Ancillary Activities
   - Total warehouse space
   - Plot ratio

5. Land Use Planning Policy
   - Land requirement
   - Other logistics land uses

6. Transport Policy
   - Logistical cost trade-offs
   - Transport – inventory - warehousing

7. Commercial Property Market
   - Logistics management practices

8. Economic Growth
   - Logistics cost trade-offs
   - Transport – inventory - warehousing

9. Cost, Prices and Interest Rates
   - Logistics cost trade-offs
   - Transport – inventory - warehousing

10. Economic Trends
    - Logistical cost trade-offs
        - Transport – inventory - warehousing

11. Material Production / Consumption
    - Logistical cost trade-offs
        - Transport – inventory - warehousing

12. Stockturn Rate
    - Logistical cost trade-offs
        - Transport – inventory - warehousing

13. Degree of Inventory Centralisation
    - Logistical cost trade-offs
        - Transport – inventory - warehousing

14. Logistics Technology / Warehouse Design
    - Physical inventory
        - Storage space

15. Ancillary Activities
    - Total warehouse space
        - Plot ratio

16. Land Use Planning Policy
    - Land requirement
        - Other logistics land uses
Conclusions

Lack of data on land requirements of logistical activities other than warehousing

Attempts to forecast the future demand for warehouse land over-dependent on simplistic modelling of relationship with GDP / GVA

Numerous factors likely to distort this relationship in the future

Need more research to model the impact of these factors individually and collectively on future logistics-related land use
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