

Summary:

Cost models for transportation and logistics

Background

As an input to the Norwegian National Transport Plan 2014-2023, new cost models for freight and logistics have been developed with base year 2010. The new cost data will after further testing replace the previous versions for use in the Logistics model. Cost functions are decomposed between elements dependent on time, distance, loading, unloading and reloading.

Transport units and cargo groups

The cost models developed cover a range of transport units and modes. The table below gives an overview of transportation units used in the Logistics model. In addition to the modes shown in the table, cost models have been developed for some sea vessels.

The table shows feasible combinations of transport units and cargo groups. These combinations are indicated in the table as either “ok”, for available combinations, or “na” for combinations of transport units and cargo groups that are not available.

Vehicle name	Cost per km - vehicle unit	Cost per hour - vehicle unit
LGV	2.62	409
Light distribution	3.17	420
Heavy distribution closed unit	4.01	456
Heavy distribution, containers	4.86	458
Articulated semi closed	5.86	471
Articulated semi, containers	5.94	500
Tank truck distance	5.55	505
Dry bulk truck	5.55	516
Timber truck with hanger	5.61	512
Termo truck	6.04	467
Break bulk lolo, 1000dwt	38	1643
Break bulk lolo,, 2500dwt	55	1808
Break bulk lolo,, 5000 dwt	75	2134
Break bulk lolo,, 9000 dwt	98	2777
Break bulk lolo, 17000 dwt	140	3413
Break bulk lolo, 40000 dwt	226	4851
Dry bulk 1000 dwt	38	1613
Dry bulk 2500 dwt	55	1621
Dry bulk 5000 dwt	75	1810
Dry bulk 9000 dwt	98	2303
Dry bulk 17000 dwt	140	3033
Dry bulk 45000 dwt	241	4126
Dry bulk 56000 dwt	272	4322
Dry bulk 76000 dwt	323	4836
Container lo/lo 8500 dwt	73	2733
Container lo/lo 14200 dwt	98	2947
Container lo/lo 23000 dwt	113	3480
Ro/ro (cargo) 8000 dwt	92	4945
Ro/ro (cargo) 15000 dwt	131	5725
Reefer 426000 cbf	197	3218
Tanker vessel 3500 dwt	74	1953
Tanker vessel 9500 dwt	116	2458
Tanker vessel 17000 dwt	149	3677
Tanker vessel 37000 dwt	216	5085
Tanker vessel 100000 dwt	376	6799
Tanker vessel 310000 dw	707	11922
Gas tanker, 35000 cbm	171	5884
Gas tanker,57000cbm	206	6950
GC (coastal sideport) 1250 dwt	40	933
GC (coastal sideport) 2530 dwt	62	1361
GC (coastal ro-ro) 4440 dwt	78	1868
Sideport, live animals	62	1361
Supply vessel offshore 3000 dwt (total).	69	5352
Tanker vessel 150000 dwt	472	8102
Chemical prod tanker coated 8000 dwt	106	3338
Chemical prod tanker coated 19000 dwt	164	4105
Gas tanker, 145000 cbm	274	23975
Hurtigbåt kyst 360 brt	174	1495
Brønnbåt 1000 dwt	29	1472
Electric combi trains	1.36	81
Electric timber trains	1.36	79
Electric system trains (dry bulk)	1.36	79
Electric wagon load trains	2.54	145
Combi trains thermo	1.36	118
Diesel timber trains	3.77	93
Electric system trains (wet bulk)	1.36	149
Car trains	2.53	194
Medium sized freight plane	47	43455
Large freight plane	71	75609

Total costs for movement of a unit between two locations, distance-dependent and time-dependent costs must be summed up.

In addition to carrying costs, there are also costs related to loading, unloading and reloading. The following terminal costs per transport unit are calculated:

- Loading and unloading costs per ton
- Loading and unloading costs per shipment

There will in practice be large variations in costs due to factors as shipment sizes, total volumes, terminal efficiencies and other factors from the representative costs presented below:

Vehicle name	Cost per ton (incl. vehicle time cost) - Cargo group dependent additional cost separate	Cost per shipment
LGV	315	51
Light distribution	215	54
Heavy distribution closed unit	174	95
Heavy distribution, containers	128	106
Articulated semi closed	161	91
Articulated semi, containers	129	100
Tank truck distance	9	85
Dry bulk truck	15	56
Timber truck with hanger	26	235
Termo truck	161	58
Break bulk lolo, 1000dwt	104	68
Break bulk lolo, 2500dwt	95	65
Break bulk lolo, 5000 dwt	97	102
Break bulk lolo, 9000 dwt	89	165
Break bulk lolo, 17000 dwt	91	302
Break bulk lolo, 40000 dwt	93	888
Dry bulk 1000 dwt	9	109
Dry bulk 2500 dwt	4	1821
Dry bulk 5000 dwt	3	3410
Dry bulk 9000 dwt	3	60240
Dry bulk 17000 dwt	3	252815
Dry bulk 45000 dwt	3	278465
Dry bulk 56000 dwt	3	360515
Dry bulk 76000 dwt	3	404244
Container lo/lo 8500 dwt	145	110
Container lo/lo 14200 dwt	137	209
Container lo/lo 23000 dwt	133	222
Ro/ro (cargo) 8000 dwt	100	274
Ro/ro (cargo) 15000 dwt	98	490
Reefer 426000 cbf	115	271
Tanker vessel 3500 dwt	15	15830
Tanker vessel 9500 dwt	7	24943
Tanker vessel 17000 dwt	5	170418
Tanker vessel 37000 dwt	3	380082
Tanker vessel 100000 dwt	2	1012869
Tanker vessel 310000 dw	1	1756627
Gas tanker, 35000 cbm	2	338420
Gas tanker, 57000cbm	2	573162
GC (coastal sideport) 1250 dwt	46	31
GC (coastal sideport) 2530 dwt	51	29
GC (coastal roro) 4440 dwt	30	31
Sideport, live animals	303	3217
Supply vessel offshore 3000 dwt (total).	464	165
Electric combi trains	140	103
Electric timber trains	17	76
Electric system trains (dry bulk)	8	185
Electric wagon load trains	57	194
Combi trains thermo	134	133
Diesel timber trains	18	88
Electric system trains (wet bulk)	8	325
Car trains	14	304
Medium sized freight plane	652	1530
Large freight plane	741	1296

Transfer costs between transport units where applicable (both per ton and shipment) can be calculated based on the costs above.

For sea transportation, distance and time-dependent costs are developed, based on two alternative principles of cost allocation to the two dimensions.

Cargo dependent costs

In addition to costs related to transport units, there are also freight and logistics costs that are depending of the specific type of cargo. The following cargo dependent costs are calculated:

- Tolls for sea-transported cargo that are additional cost to terminal costs in ports (in NOK per ton)
- Inventory costs (in NOK per ton and hour)
- Order costs (in NOK per shipment)
- Time cost for cargo in transit (in NOK per ton and hour)
- Degradation cost for cargo in transit (in NOK per ton and hour)