

Transportation

Distances to cities:

Mæddoakwés/16:00 65 km Akanakvéi/14:00 60 km Akeldædra/13:00 45 km
Bellædha/12:00 70 km Sumiuperakwa/9:00 70 km Néfa/7:00 60 km Ora 75 km OR
Isurdhuna/5:00 75 km

Mæddoakwés/4:00 20 km Ejnopéla/3:00 17 km Ornakwés 13 km Melita 21 km
Gramakwés 17 km Swadlædha 2 km Endraidha/3:00 (Mæd to End 90 km)

Melwika/4:00 85 km Gordha/7:00 85 km Kostekhéma/11:00 (OR Gimutroba/9:00) 85 km
Moruagras/3:00 20 km Réjéivika/3:00 65 km Isurdhuna 5:00

Melwika/4:00 30 km Médhæla 25 km Mædhpéla 65 km Endraidha/3:00 36 km
Brébatroba/2:00 55 km Weranopéla/12:00 35 km Tripola/10:00 40 km
Mæddwoglubas/8:00 50 km Ora/7:00 26 km Pértatranisér 27 km Néfa

Akanakvéi 90 km Anartu 100 km Ora

Mæddoakwés/4:00 50 km Sullædha/2:00 25 km Akeldædra/1:00 45 km Bellædha/12:00
(120 km total)

Melwika 3 km Nénaslua 3.5 km Béranagrés 4.5 km Morituora 5 km Mæddoakwés
Béranagrés 6 km Boléripludha 5 km Mæddoakwés

Isurdhuna to northern valley village, 42 km; to southern valley village, 35 km

Gordha 35 km Sértroba 35 km Awstroba 35 km Wurontroba 35 km Weranopéla 35 km
Tripola (175 km total)

Melwika 70 km Dentastéa 50 km Yujdwoakwés 50 km Khermdhuna 80 km Isurdhuna
(250 km total, vs. 385 km via the sea route)

Northern basin: a crater 270 km in diameter (floor edge).

Miller Transportation Company Steam Wagon schedule, Year 3:

Day 1: 7 am Mæddoakwés; 8 am (1, +0) Melwika; 2:30pm (3.5, +3) Gordha; 2 hr stop; 5
pm (3.5, -3.5) Melwika; 6pm (1, -0) Mæddoakwés

Day 2 10am Melwika; 11am Mæddoakwés; 10:30am (2:30,-3) Nuarjora; 12:30pm (2, -0)
Akeldædra; 12:30pm (2, -2) Bellædha; 1:30pm (3, -2) Sumiuperakwa; 3pm (3.5, -2) Néfa;
5pm (4, -2) Isurdhuna [AND 6pm (3, +0) Ora]

Day 3: [8am Ora;] 6am Isurdhuna; 11am (3, +2) Néfa; 4pm (3, +2) Sumiuperakwa; 9pm (3, +2) Belledha; [eventually] 1am (2, +2) Akeldedra; 3pm (2, +0) Nuarjora; 8am (2, +3) Meddoakwés; 9am (1, +0) Melwika

Day 4: 7am Belledha; 11am (2, +2) Akeldedra; 1pm (2, +0) Nuarjora; 6pm (2, +3) Meddoakwés; 7pm (1, +0) Melwika

Day 5: [8am, Meddoakwés;] 9 am, Melwika; 10am (1, -0) Médhela; 11am (1, -0) Medhpéla; 11am (2, -2) Endraidha; 10:30am (:30 stop, 3, -4) Tripola; 9:30am (1, -2) Meddwoglubas; 10:30am (2, -1) Ora; 1:30pm (1 stop, 2, +1) Meddwoglubas; 4:30pm (1, +2) Tripola [Note: separate steamwagon leaves Néfa at 7 a.m, arriving Ora 10 am for the 10:30 to Tripola; it returns to Néfa, leaving Ora at 2 p.m. and arriving 5 p.m.]

Day 6: 5:30am Tripola; 2:30pm (3, +6) Endraidha; 6:30pm (2, +2) Medhpéla; 8:00pm (1:30, +0) Melwika; 9:00 pm (1, +0) Meddoakwés

Typical steam wagon with 100 hp engine can pull 10 tons at 20 mph and 20 tons at about 8 mph. The Oran steam wagons, with 300 hp engines, can do far more.

Miller Transportation Company Schedule, Year 4:

Hotter fires using coke and forced air allow faster speeds for passenger transport (30 mph/50 kmph)

1st and 3rd days:

7:45am Melwika; 8:15am Meddoakwés; 6:45 (1:30, -3) Nuarjora; 8 am (1:15, -0) Akeldedra; 7 am (1, -2) Belledha; 6:30am (1:30, -2) Sumiuperakwa; 6:00am (1:30, -2) Néfa; 7:15 am (1:15, +0) Ora; 9:15 am (1 +1) Meddwoglubas; 12 pm (0:45, +2) Tripola; 2 hour break; 1:45 pm (2 hr break, 0:45, -1) Meddwoglubas; 1:45 pm (1, -1) Ora; 3 pm (1:15, 0) Néfa; 6:30pm (1:30, +2) Sumiuperakwa; 8:00pm (1:30, +2) Belledha; overnight stop, leave 7am; (1, +2) 10am Akelkaita; 11:15am (1:15, 0) Nuarjora; 3:45pm (1:30, +3) Meddoakwés; 4:15pm (:30, 0) Melwika

2d and 4th days:

9:30am, Meddoakwés; 10am (0:30, 0) Melwika; 10:30am (0:30, -0) Médhela; 11:00am (0:30, -0) Medhpéla; 10:15am (1:15, -2) Endraidha; 8:00am (1:45, -4) Tripola; 6:45am (0:45, -2) Meddwoglubas; 6:45am (1, -1) Ora; 8am (1:15, 0) Néfa; 11:30am (1:30, +2) Sumiuperakwa; 3pm (1:30, +2) Belledha; 3:30pm (1:30, -2) Sumiuperakwa; 3:00pm (1:30, -2) Néfa; 4:15pm (1:15, +0) Ora; 6:15 pm (1 +1) Meddwoglubas; 9 pm (0:45, +2) Tripola; overnight stay, leave Tripola 7 am; 12:45 pm (1:45, +4) Endraidha; 4:00pm (1:15, +2) Medhpéla; 4:30pm (0:30, 0) Médhela; 5:00pm (0:30, 0) Melwika; 5:30 pm (0:30, 0) Meddoakwés

5th day: 7:00 am Mɛddoakwɛs 7:30 am (0:30, 0) Mɛlwika; 12:30 pm (2, +3) Gordha; 5:30 pm (3,+2) Kostakhɛma; 6:30pm (3, -2) Gordha; 5:30pm (2,-3) Mɛlwika; 6:00 pm (0:30, 0) Mɛddoakwɛs

1st, 2d, 3d, 4th days:

8:00am Nɛfa; 8:00am (2, -2) Isurdhuna; 1/2 hour stop, leave 8:30; 9:30am (1, 0) North Valley; 10:30am (1, 0) Isurdhuna; 11:30am (1, 0) South Valley; 12:30pm (1, 0) Isurdhuna; 6:30pm (1 hr stop, 3, +2) Nɛfa [freight trip]

6:30am Isurdhuna; 7:30am (1,0) South Valley; 8:30am (1,0) Isurdhuna; 12:30pm (2, +2) Nɛfa; 3:30 (2 hour stop, 3, -2) Isurdhuna [freight trip]; 4:30pm (1 hr stop, 1,0) North Valley; 5:30pm (1,0) Isurdhuna; 6:30pm (1,0) South Valley; 7:30pm (1,0) Isurdhuna

Year 5:

Headlights and safe roads allow reliable nighttime transport:

Daily, Counterclockwise: 7:45am Mɛlwika; 8:15am Mɛddoakwɛs; 6:45 (1:30, -3) Nuarjora; 8 am (1:15, -0) Akɛldɛdra; 7 am (1, -2) Bɛllɛdha; 6:30am (1:30, -2) Sumiuperakwa; 6:00am (1:30, -2) Nɛfa; 7:15 am (1:15, +0) Ora; 9:15 am (1 +1) Mɛddwoglubas; 12 pm (0:45, +2) Tripola; 5:45 pm (1:45, +4) ɛndraidha; 9:00pm (1:15, +2) Mɛdhpɛla; 9:30pm (0:30, 0) Mɛdhɛla; 10:00pm (0:30, 0) Mɛlwika; 10:30 pm (0:30, 0) Mɛddoakwɛs

Daily, Clockwise: 9:30am, Mɛddoakwɛs; 10am (0:30, 0) Mɛlwika; 10:30am (0:30, -0) Mɛdhɛla; 11:00am (0:30, -0) Mɛdhpɛla; 10:15am (1:15, -2) ɛndraidha; 8:00am (1:45, -4) Tripola; 6:45am (0:45, -2) Mɛddwoglubas; 6:45am (1, -1) Ora; 8am (1:15, 0) Nɛfa; 11:30am (1:30, +2) Sumiuperakwa; 3pm (1:30, +2) Bɛllɛdha; (1, +2) 6pm Akɛldɛdra; 7:15pm (1:15, 0) Nuarjora; 11:45pm (1:30, +3) Mɛddoakwɛs; 12:15am (:30, 0) Mɛlwika

Western Shore: 6:45 a.m. Ora; 8:45 a.m. (1, +1) Mɛddwoglubas; 11:30 a.m. (:45, +2) Tripola; 1:00 p.m. departure Tripola; 11:45am (0:45, -2) Mɛddwoglubas; 11:45am (1, -1) Ora; 1pm (1:15, 0) Nɛfa; 4:30pm (1:30, +2) Sumiuperakwa; 8pm (1:30, +2) Bɛllɛdha; 7:30pm (1:30, -2) Sumiuperakwa; 7:00pm (1:30, -2) Nɛfa; 8:15pm (1:15, +0) Ora; (depending on demand) 10:15 pm (1 +1) Mɛddwoglubas; 1am (0:45, +2) Tripola; 11:45 p.m. (0:45, -2) Mɛddwoglubas; 11:45pm (1, -1) Ora

Every other day: 7:00 am Mɛddoakwɛs; 7:30 am (0:30, 0) Mɛlwika; 12:30 pm (2, +3) Gordha; 5:30 pm (3,+2) Kostakhɛma; 5:30pm (2, -2) Gordha; 4:30pm (2,-3) Mɛlwika; 5:00 pm (0:30, 0) Mɛddoakwɛs

Year 7 variant every other day to Moruagras: 2:30 am Mɛlwika; 7:30 am (2, +3) Gordha; 11:30 am (2,+2) Kostakhɛma; 5:30 p.m. (2, +4) Moruagras; 6:30pm leave Moruagras; 4:30 p.m. (2,-4) Kostakhɛma; 3:30 p.m. (2, -3) Gordha; 2:30pm (2,-3) Mɛlwika

Year 10 Bus Schedule

(assume 80km/hr concrete road; 70 km/hr gravel road or concrete road through villages)

Ora/Melwika Clockwise run: Melwika/8:30 a.m. Meddoakwés/8:00 Sullendha/5:15
Akeldedra/3:50 Belledha/2:00 a.m Sumiuperakwa/22:00 Néfa/19:00 Ora/18:00 (5:30
duration; 3:00 to Belledha, 2:30 to Melwika)

Néfa/Melwika Counterclockwise Run: Melwika 8:15 Meddoakwés/7:45 Ejnopéla/6:15
Ornakwés/6:00 Melita/5:45 Gramakwés/5:25 Swadlendha/5:12 Endraidha/5:10
Brébatroba/3:40 Weranopéla/0:55 Tripola/22:25 Meddwoglubas/20:55 Ora/20:00
Pértatranisér/19:30 Néfa/19:00 (duration, 2:30 Néfa to Tripola, 3:50 Tripola to Melwika,
6:20 Néfa to Melwika)

Melwika/Ora Counterclockwise run: Melwika/11:00 Meddoakwés/11:30 Sullendha/10:20
Akeldedra/9:40 Belledha/9:25 Sumiuperakwa/7:25 Néfa/6:25 Ora/7:25 (5:25 duration;
2:25 to Belledha, 3:00 to Ora)[note: this returns the bus used for the Ora/Melwika
clockwise run]

Melwika/Néfa Clockwise Run: Melwika 10:45 Meddoakwés/11:15 Ejnopéla/10:35
Ornakwés/10:50 Melita/11:05 Gramakwés/11:25 Swadlendha/11:40 Endraidha/11:45
Brébatroba/11:15 Weranopéla/10:00 Tripola/8:30 Meddwoglubas/7:00 Ora/7:00
Pértatranisér/7:30 Néfa/8:00 [note: this returns the bus used for the Néfa/Melwika
counterclockwise run]

Western Shore Run: Néfa/6:30 Pértatranisér/7:00 Ora/7:30 Meddwoglubas/9:30
Tripola/12:00 Meddwoglubas/10:30 Ora/10:30 Pértatranisér/11:00 Néfa/11:30
Repeat: 12:00, 18:30

Farmer Special Northbound Run: Belledha/6:45 Akeldedra/7:20 Akanakvéi/7:30
Ornakwés/8:00 Endraidha/7:10 Brébatroba/5:40 Weranopéla/2:55 Tripola/0:25 (6:20
between the two cities)

Farmer Special Southbound Run: Belledha/1:45 Akeldedra/3:30 Akanakvéi/5:30
Ornakwés/7:00 Endraidha/8:00 Brébatroba/7:30 Weranopéla/6:15 Tripola/5:00
Weranopéla 7:45 Tripola 6:45

Basin Run: Belledha/6:30 Yusdwoakwés/6:40 Dentastéa/11:10 Yusdwoakwés/7:40
Belledha/7:50; Belledha/8:00 Khermdhuna/4:30 Yusdwoakwés/8:50 Belledha/9:00
Repeated: 10:00, 13:30, 17:00, 20:30

Belledha-Sumiuperakwa Run: Belledha/6:50 Klénvika/6:20 Sumiuperakwa/4:50
Klénvika/7:20 Belledha/8:50

Repeated at 6:50, 9:00, 12:00, 15:00, 18:00

Penkakwés Eastbound Run: Bellédha/6:00 Akeldédra/7:50 Sulléndha/9:15

Mèddoakwés/12:00 Mèlwika/12:30

Departs Bellédha 2:00 (this is part of Ora/Mèlwika Clockwise Run), 6:00, 11:30, 16:00, 19:00 (to Sulléndha only)

Penkakwés Westbound Run: Mèlwika/9:30. Mèddoakwés/10:00 Sulléndha/8:50

Akeldédra/8:20 Bellédha/7:55 (Note: this is part of Mèlwika/Ora Counterclockwise above)

Departs Mèlwika 9:30, 11:00 (part of the Mèlwika/Ora Clockwise Run), 13:00, 17:00, 22:15 (Sulléndha to Bellédha only) [Note: 1 bus based in Bellédha can do this, leaving at 6:00 and ultimately returning 7:55 the next morning, so a different bus is needed the next day.]

Dhébakwés Run: Tripola/6:00 Wèranopéla/9:00 Tripola/8:00

Repeated every 2:30 (6:00, 8:30, 11:00, 1:30, 4:00, 6:30)

Glaktakwés Run: Tripola/6:00 Snékhépéla/6:45 Tripola/7:45

Repeated at 6:00, 8:00, 12:00, 16:00, 18:00, 20:00

Spine Westbound Run (toward Mèlwika): Mèlwika/7:30 Gordha/9:15 Kostèkhéma/11:45

Moruagras/14:15 Réjévika/13:35 Isurdhuna/14:05 Néfa/14:35 Ora/13:35 (8:55 duration)

Spine Run Eastbound Run (toward Ora): Mèlwika/17:30 Gordha/22:00 Kostèkhéma/3:30

Moruagras/9:00 Réjévika/9:45 Isurdhuna/13:15 Néfa/17:45 Ora/18:45

Arjakwés Run: Mèlwika/4:30 Mèddoakwés/5:00 Èjnopéla/4:20 Akanakvéi/5:00

Èjnopéla/5:40 Mèddoakwés/7:00 Mèlwika/7:30

Repeated at 4:30, 6:10 (Èjnopéla high school), 8:30, 12:30, 16:30

Èndraidha-Mèlwika Run: Mèlwika/6:00 Mèddowkawés/6:30 Èjnopéla/5:45

Ornakwés/6:00 Èndraidha/6:45 Ornakwés/7:30 Èjnopéla/7:45 Mèddoakwés/9:00

Mèlwika/9:30

Repeated every 4 hours (6:00, 10:00, 14:00, 18:00) complementing the Arjakwés Run

Typical steam wagon needs a cash income of 3,000 dhanay per year to break even; 1,000 to cover purchase (over several years); 500 to cover repairs; 1000 to cover salaries; 500 to cover fuel. This amounts to about 50 dhanay per week or 10 dhanay per day. By year 10, the salary is 2,000 and the minimum cash flow required is 4,000.

Yr 16: Driver's salary, 5 đ/day; purchase, insurance, repairs, 5 đ/day; taxes, profits, office expenses, 5 đ/day; thus busses must make 15 đ/day. If a bus carries 100 local

passengers/day, the fare needs to be 6 dontay round trip. A long-distance bus charges much more, commuter and high school busses much less. Intercity busses are 10 dontay to the next province 1 way (1 đ round trip), 20 dontay/1 đ to 80+ km, 2 đ for 160+ km.

If the company has 250 busses, generating 15 đ/day of revenue, that's 5850 đ per year per bus and 143,000 đ/yr revenue total per year. Light cargo and postal packages on the busses raise it to 160,000 or so. The trucking company has 50 trucks moving 40 tonnes at a time (sometimes 100 tonnes a day), 130,000 tonnes a year, generating about 130,000 đ of revenue, so the company earns about 270,000 đ and makes about 27,000 đ profits.

Year 24: Plan for integration of the Western Shore Transportation System

Busses cost 1500 đ per year to purchase, 500 đ per year to maintain, 1000 đ per year for fuel, 1,000 miscellaneous costs, 2,500 đ per year per driver (2 8-hr shifts) so the cost is 9,000 đ per year.

Route 14, Domomitruí-Ejnopéla-Endraidha, 75 km, 3 hours round trip, 5/day

Route 3, Endraidha-Melita-Ejnopéla-Meddoakwés, 90 km, 3 hours round trip, 5/day

Route 3/5, Endraidha-Melita-Meddoakwés-Melwika, 100 km, 3 hours round trip, 5/day

Route 4, Melwika-Meddoakwés-Sullendha, 66 km, 2.5 hours round trip, 6/day

Route 1, Melwika-Meddoakwés-Nuarjora-Arjdhura, 90 km, 3 hrs round trip, 6/day

Route 2, Melwika-Medhpéla-Endraidha, 120 km, 3 hrs round trip, 5/day

Route 16, Sullendha-Akras-Ornakwés-Melita-Endraidha, 135 km, 4 hrs round trip, 4/day
Melwika-Meddoakwés, 16 km, 1 hr round trip, 2 busses, 16/day

Route 1 Melwika-Gordha, 85 km, 3 hrs round trip, 5/day

Sumiuperakwa-Melwika-Roktatroba-Bolériledha, 90 km, 3 hrs round trip, 4/day

Sumiuperakwa-Melwika-Yimuaidha-Megdhuna-Meddoakwés, 40 km, 1.5 hrs round trip, 10/day

(12 busses, 3600 capacity)

Route 21: Meddoakwés-Melwika-Khermdhuna-Isurdhuna, 250 km, 8 hrs round trip, 2/day

Melwika-Meddoakwés-Endraidha-Tripola-Ora, 301 km, 9 hrs round trip, 2/day

Melwika-Medhpéla-Endraidha-Tripola-Ora, 340 km, 9 hrs round trip, 2/day

Melwika-Meddoakwés-Sullendha-Belledha-Ora, 336 km, 9 hrs round trip, 2/day

Belledha-Nuarjora-Meddoakwés, 150 km, 5 hrs round trip, 3/day

Belledha Seashore, 30 km, 1 hr round trip, 12/day, 2 busses

Belledha-Yujdwoakwés-Belledha, 30 km, 1 hr round trip, 10/day

Dentastéa-Yujdwoakwés-Bellesha, 30 km, 1 hr round trip, 10/day

Belledha-Ora, 200 km, 6 hrs round trip, 3/day

Lépawsdomas-Luktrudema-Pértatranisés, 50 km, 1.5 hrs round trip, 10/day

Néfa Basin, 60 km, 2 hr round trip, 8/day, 3 busses

Tripola-Néfa, 150 km, 4 hours round trip, 4/day (3 busses)

Awswika-Meddwoglubas-Klenmara, 30 km, 1 hr round trip, 10/day

Weranopéla-Snékhpéla-Tripola, 70 km, 2.5 hr round trip, 8/day

Ora-Isurdhuna, 135 km, 4 hrs round trip, 4/day
 Néfa-Isurdhuna, 75 km, 3 hrs round trip, 5/day
 Route 51/Ora, 80 km, 3 hrs round trip, 6/day, 2 busses
 Melwika-Gordha-Kostakhéma-Moruagras-Réjéivika-Isurdhuna, 310 km, 9 hrs round trip, 2/day
 Moruagras-Réjéivika-Ora, 165 km, 5 hr round trip, 3/day
 Kerda Valley, 77 km, 2.5 hrs round trip, 6/day, 4 busses
 Awstroba-Medhpéla, 110 km, 3 hrs round trip, 3/day
 Wurontroba-Gordha, 100 km, 3 hrs round trip, 3/day
 Gimutroba-Gordha, 60 km, 2 hrs round trip, 4/day
 (32 busses)

Yr3:

Timber, limestone, ice, coal, and guano cost about 2 dhanay per ton (assuming 10 tons moved at a time, half the cost is transportation and half loading). A man can move about 20 to 25 tonnes of dirt per day with a shovel at a pay of 1.25 to 1.5 dhanay per day. By Yr 6, larger trucks cut transportation costs in half.

Ice yields 80 kcals per kg to melt, equivalent of about 1/10 kwh. If air conditioning requires 6 kwhr to cool 100 m², that requires melting of 60 kg of ice per hour and 1500 kg per day. Thus 10 tonnes would last 7 days. The mansion at Pértatranisé has an area of 300 m² but not all of it is cooled at any time. Central air conditioning systems for houses are usually 1-5 tons capacity, meaning the equivalent of melting 1-5 tonnes of ice per day.

Cement probably costs 5 dhanay per ton to make (2, transport of raw material; 2; conversion to lime; 1 profit). Mixed 1:2:3 (cement:sand:coarse aggregates) for road construction, at 2 dhanay per ton for the other items, 15 dhanay buys 6 tons of concrete. Assume that's 2 cubic meters. At a thickness of 15 cm that makes 13 square meters of road surface. Thus roads can be built at costs similar to 1 dhanay per square meter (say, 1.5 dhanay/sq meter to be on the safe side). A road 5 meters wide and 20 km long (Melwika to Meddoakwés) would cost 150,000 dhanay. Concrete roads are about 7,500 dhanay per km to build. By Yr 6 this is probably halved as well.

Standard 8 meter wide road, Tripola to Néfa (150 km) at 6,000 d/km will cost 900,000 d to build. But if the world has 75 trucks and busses paying 500 d/yr registration fee and 100 cars paying 100 d/yr, they pay 47,500 d per year and they will cover the costs of the road in 19 years.

The National Road: 66 foot right of way, 20 foot wide road surface, Macadam (12-18 inch thick layer of stones up to 7 inches across, followed by a layer of 3-inch stones 6 inches thick, followed by a top layer of finer gravel and dirt. Road had ditches on both sides and the surface was packed down by rollers. Maximum slope was 5 degrees. Estimated cost was \$6,000 per mile to build; in hill sections, it was actually \$9,000 to \$13,000 per mile. Road builders were paid as much as \$1/day, as little as about 20-25 cents/day. Converting this to dhanay/km, it would be about 10,000 dhanay/km.

Gravel roads are cheaper: if a 10-tonne truck can short-haul 50 tonnes per day (5 round trips per day), the material costs 16 dhanay for 50 tons (20 cubic meters, 3 đ to load, 3 đ to unload/distribute, 10 đ to transport) and the thickness is 15 cm, and width is 3 meters rather than 5 meters (with ungraveled 2-m shoulder for vehicles to pass), and preparation is minimal, thus the roads cost 0.4 dhanay per meter of length (call it 0.5 đ). Thus 14 km of farm roads cost 7,000 dhanay to gravel. This is ¼ my original estimate. I suspect construction of gravel roads in Melwika will create experience to apply elsewhere.

[Note: **When transporting gravel over a distance of 10 km the total gravel costs per km may amount to US\$4.70 to US\$6.55 per m³ placed on the forest road, thus the cost of a 25 cm thickly gravelled 4 m wide forest road would be US\$4 700 to US\$6 550, <http://www.fao.org/docrep/W8297E/w8297e04.htm>; that's 1980\$ and equivalent of maybe 200 đ/km, but involves heavy use of machinery]**

Cement is 1/6 of the 15 centimeter thickness, or 2.5 cm. Thus a cubic meter of cement makes 40 square meters of road. At 8 meters width, this will make 5 meters of length and 150 km of road (Néfa to Tripola) will require 30,000 cubic meters of cement, mass about 100,000 tonnes. This will require burning about 100,000 tonnes of wood, or about 2,000 agris (20 km²).

Erie Canal: 4 feet deep, 40 feet wide, 365 miles long, cost \$7,144,000 (\$19,600/mi, \$12,100/km). The loan was paid off in 9 years!

Concrete Road Schedule:

Where	Yr 7	8	9	10	11	12	13	14	15	16	17
Mel/Med 16 km	250										
Med/ejn/Orn/Meli/ Gram/endr (90)		250	250	250	250	250					
Rts 5 Melit/Melw							150	150	150	150	
Endri/Weranop							250	250	250		
Rte 4 Medd/Akeld									100	250	500
Néfa/Arjdhura		200	200	200	200	300	300	400	400		
Néfa/Trip., 150 km		600	600	400							
To Weranp, 35 km					350						
To Snékhpeła, 35							100	100	100		
To Rudh, 25 km						250					
To Isurdhuna, 75 k					250	250	250				
Kerda, 120 km								300	300	300	300
Sumilara, 150 km									300	500	700
To Gordha									100	300	100
Gordha to Kostakhéma											100

Totals	250	1050	1050	1200	1050	1050	1050	1200	1700	1800	1700
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After year 17: concreting Gordha to Kostekhéma continues; on to Réjéivika; Rte 2 Melwika to Endraidha; Melwika to Isurdhuna via north polar basin; Gordha to Tripola via Wurontroba

Mitru says: “we’re shipping 120 gurnis of ice per month from Kostekhéma, 150 from Snékhpéla, and 100 from Khermdhuna; 150 gurnis of guano per month from Arjdhura; 100 gurnis of limestone a month from Nuarjora; 150 gurnis of timber a month from Akeldædra; 200 gurnis of meat a month from Gordha; 50 gurnis of iron a month from Gimutroba and 100 from Awsmoritua; 100 gurnis a month of general cargo from Melwika and about the same from Mæddoakwés; 100 gurnis per month of wheat to each city’s granaries; etc. I’m not even enumerating the cargo flowing on the western shore, which is bigger. We move 500 people a day in the valley and when school starts it’ll double. We move 1,500 per day worldwide and it will double when school starts as well. We moved twenty thousand people to Isurdhuna for pilgrimage.” Vol. 9, p. 264. This requires 60 passenger busses and 10 trucks (cargo is about 3,000 gurnis per month and 100 per day).

Steam Wagon Census, Fall Year 3: 19 manufactured in 14 months

Captured and destroyed:	1
Army:	5
Mitru Transport	5
Réjé	1
Lord of Ora	2
Lord of Néfa	1
Lord of Tripola	2
Lord of Belledha	1
Lord of Isurdhuna	1

Future purchases at 3,000 each: Melwika city, Dwobergones, Anartu, Mæddwoglubas, Lepawsones, Mitru, Army; then even cheaper purchases