

Feedstocks for Energy Production in Ireland - challenges in developing economically sustainable supply chains.

Dr. Ger Devlin
Biosystems Engineering
University College Dublin
Belfield
Dublin 4
Ireland
ger.devlin@ucd.ie

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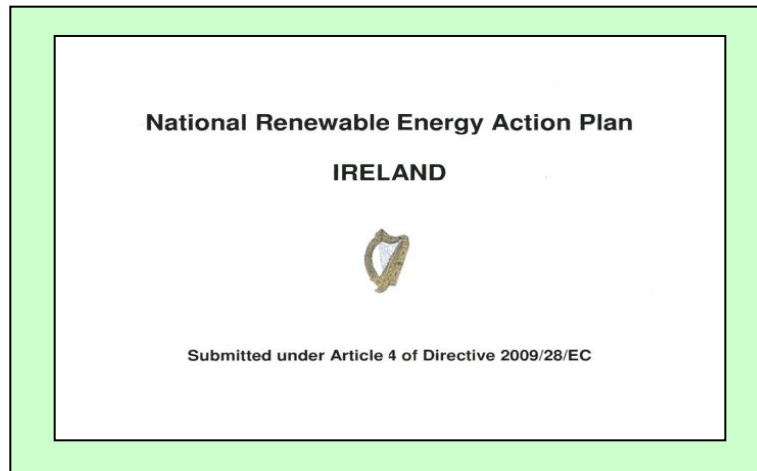


Irish Government Policy



White Paper, March 2007

- Set a target of 30% co-firing in the 3 peat stations by 2015.

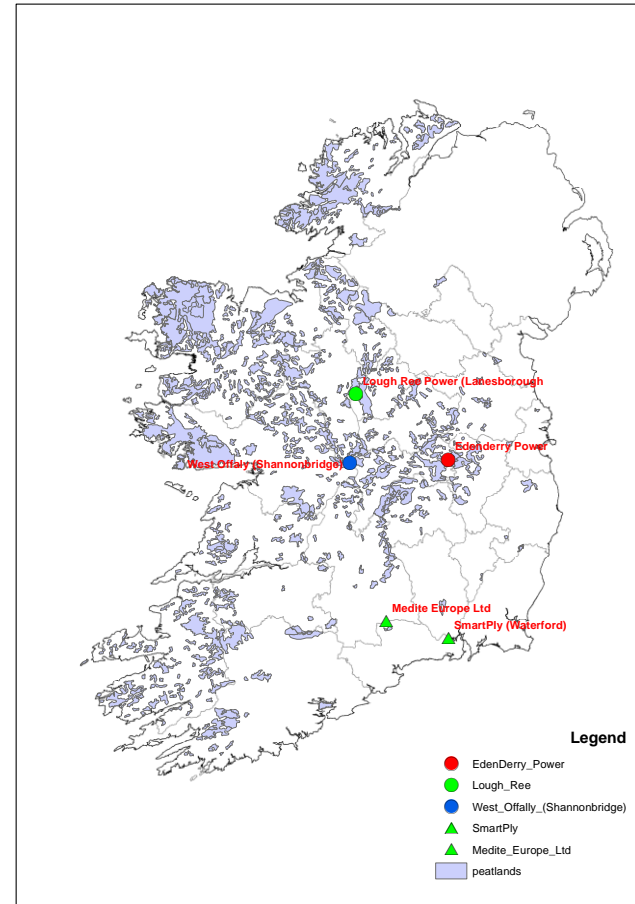


NREAP, July 2010

- Generation of 1,006 GWh from bioenergy in 2020, of which 687 GWh from solid biomass

Peat Fired Stations

- 3 peat fired power stations
 - Edenderry Power (2000)
 - BNM (128 MWe)
 - Lough Ree Power (2004)
 - ESB (100 MWe)
 - West Offaly Power (2005)
 - ESB (150MWe)
- Total annual electricity output of 378 MWe.
- 6% of Ireland's total primary requirement (TPR)



...

- 4 M tonnes of milled peat harvested annually from 20,000 ha peatland.
- Approx 3.08 M tonnes used in the Power Stations.
- 2.8 M tonnes of CO₂ / annum.
- 4.1% of Ireland's GHG emissions.
- Edenderry now increasing the use of biomass through co-firing.

Edenderry Power



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Biomass Stockpile



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Biomass Unloading Area



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Walking floor trailer



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West Offaly



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Lough Ree



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Edenderry Volumes & Specification

Biomass Required

	<u>(kt)</u>
2008	20
2009	72
2010	110
2011	150
2012	180
2013	220
2014	260
2015	300
2020	500

Quality Specification

Moisture	10 – 60%
Wt. Av. m.c.	>45%
Ash	<5%
Size	<40mm
Gross CV	>18 GJ/t
Chlorine	<0.1%
Ash Deform.	>1000 °C

Biomass Targets 2015

Total: 300,000 tonnes

Category	Biomass Type	(kt)
Energy Crops	Willow	40
	Miscanthus	10
Forest Materials	Sawmill residues	100
	Forestry thinnings	50
Dry Materials	Wood Pellets, PKS, Almond Shells, etc.	100

Biomass Targets 2020

Total: 500,000 tonnes

Category	Biomass Type	(kt)
Energy Crops	Willow	100
	Miscanthus	10
Forest Materials	Sawmill residues	100
	Forestry thinnings	100
Dry Materials	Wood Pellets, PKS, Almond Shells, etc.	190

Biomass Co-fired 2010

Material	Weighed Tonnes (t)	Energy Tonnes / Peat Displaced	Energy Tonnes (%)
<u>Forest Materials</u>			
Woodchip	58,835	51,453	47.50%
Wood pellets	9,202	20,391	18.80%
Sawdust	12,409	9,168	8.50%
<u>Energy Crops</u>			
Willow Chip	5,208	5,156	4.80%
Miscanthus	1,187	1,979	1.80%
Black Oats	48	99	0.10%

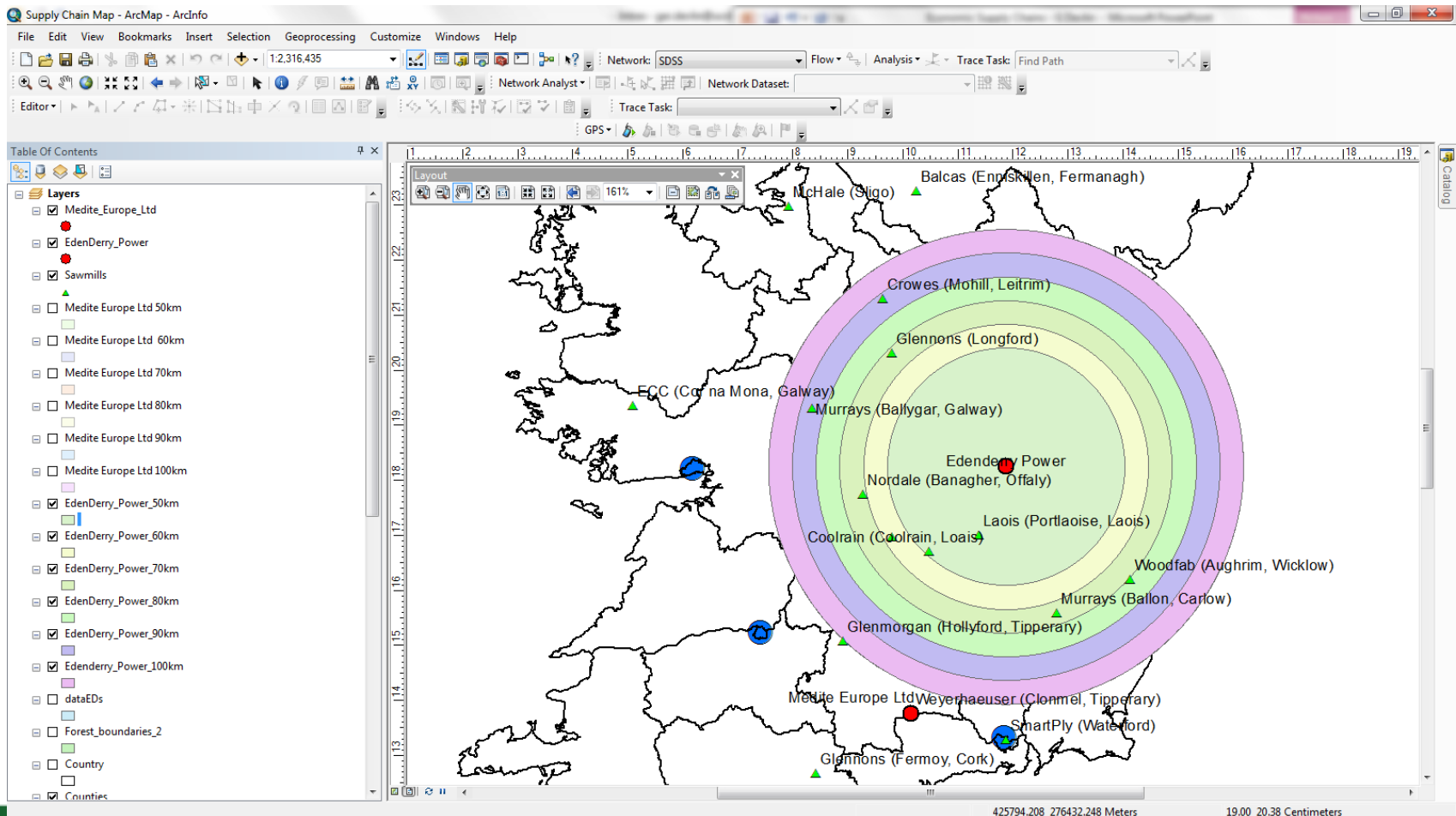
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Material	Weighed Tonnes (t)	Energy Tonnes / Peat Displaced	Energy Tonnes (%)
<u>Dry Materials</u>			
Palm Kernel Shells	7,657	15,144	14.00%
Almond Shells	2,199	4,452	4.10%
Olive Pellets	125	269	0.20%
Sunflower Pellets	40	82	0.10%
Grape Meal	30	62	0.10%
Soya Hulls	29	60	0.10%
Total	96,969	108,315	

Sources of wood fibre for Energy in Ireland (000 m³ OB)

	2008	2009	2010	Wet Tonnes (000)
Roundwood	2,503	2,421	2,708	
Sawmill residues	846	838	842	757.8
Wood-based panel residues	106	94	101	
Post- consumer recovered wood	208	200	280	
TOTAL	3,663	3,553	3,931	

How much available for Edenderry 2015



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- Looking at radius catchment area of sawmills between 50km – 100km around Edenderry.
- 300,000 tonnes TOTAL biomass needed (2.5¹⁴ PJ).
- 100,000 tonnes to come from sawmill residues (slide 12).

- 10 sawmills fall within radius.
- 205,800 m³ of sawmill residues in 2010.
- 185,220 wet tonnes (Coillte conversion rate of 1m³ = 0.9 tonnes).
- 1.55 PJ (50% MC).
- Excess of 85,220 tonnes currently available for 2015.

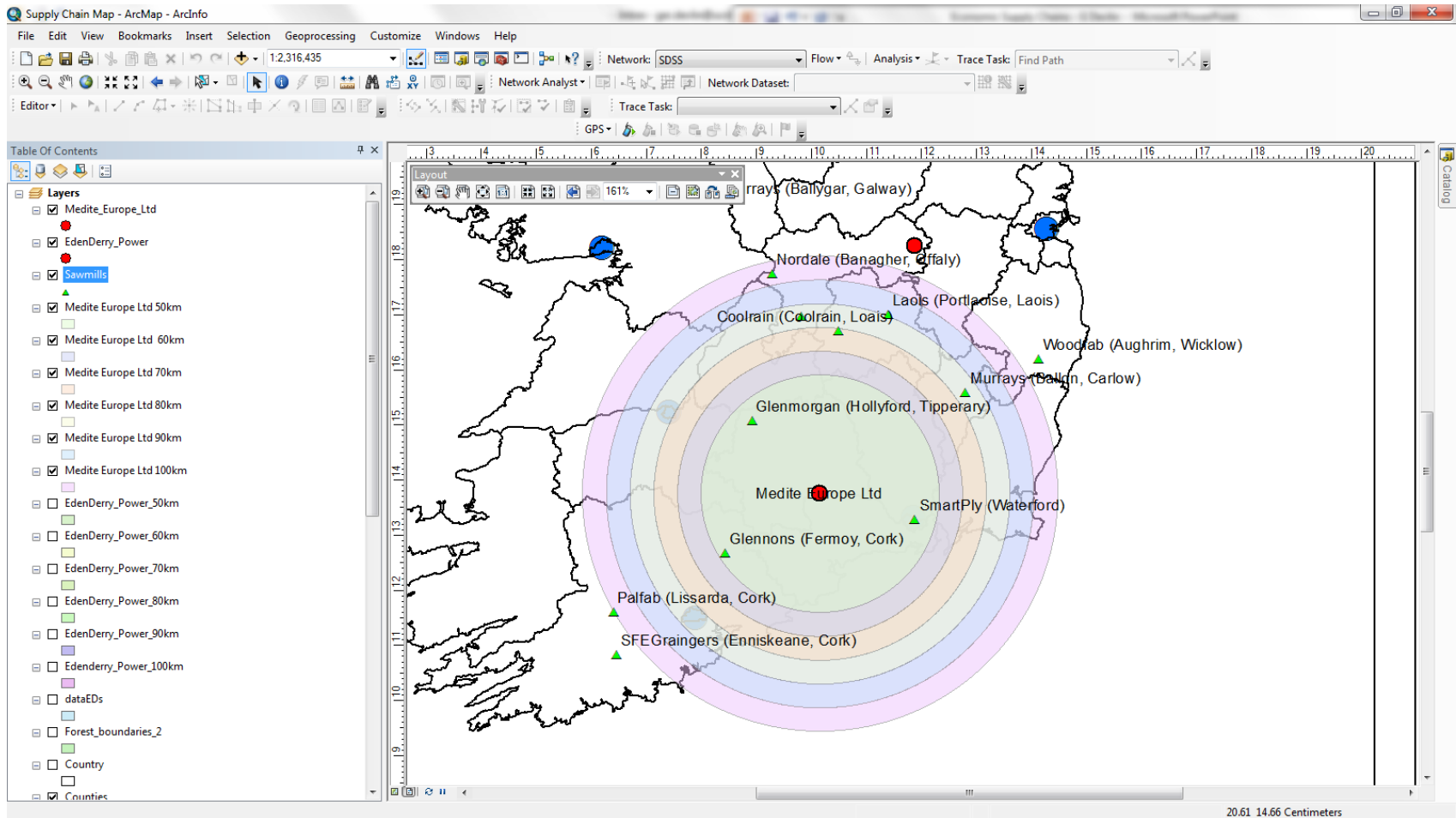
Residues for Edenderry

MILL_NAME	Chip Prod. (m3)	Chip Prod (wet tonnes)	DIST TO EDENDERRY
Balcas (Enniskillen, Fermanagh)	192,500	211,750	130
Coolrain (Coolrain, Loais)	31,500	34,650	50
Crowes (Mohill, Leitrim)	7,000	7,700	90
Doherty (Cloghan, Donegal)	63,000	69,300	190
Drenagh (Limavaddy, Derry)	105,000	115,500	200
ECC (Cor na Mona, Galway)	14,000	15,400	160
Glenmorgan (Hollyford, Tipperary)	28,000	30,800	100
Glennons (Fermoy, Cork)	70,000	77,000	160
Glennons (Longford)		0	70
Laois (Portlaoise, Laois)	7,000	7,700	50
McHale (Sligo)	38,500	42,350	150
Murrays (Ballon, Carlow)	2,800	3,080	70
Murrays (Ballygar, Galway)	84,000	92,400	90
Nordale (Banagher, Offaly)	31,500	34,650	70
Palfab (Lissarda, Cork)	122,500	134,750	200
Raudon Teo (Fintown, Donegal)	7,000	7,700	190
SFEGraingers (Enniskeane, Cork)	5,250	5,775	220
T&J Standish (nr Leap Castle, Offaly)	3,500	3,850	60
Woodfab (Aughrim, Wicklow)	10,500	11,550	80
	823550.00	905905.00	205800.00

Scenario – all mills available

- 10 mills within 100km = 185,220 wet tonnes (1.55 PJ)
- 9 other mills between 130km – 220km = 700,105 m³ or 630,094 wet tonnes.
- Enough biomass to meet 2020 targets of 500,000 tonnes with residues alone??
- Cannot neglect competing users – Medite Europe Ltd currently main user.

Medite 50km – 100km

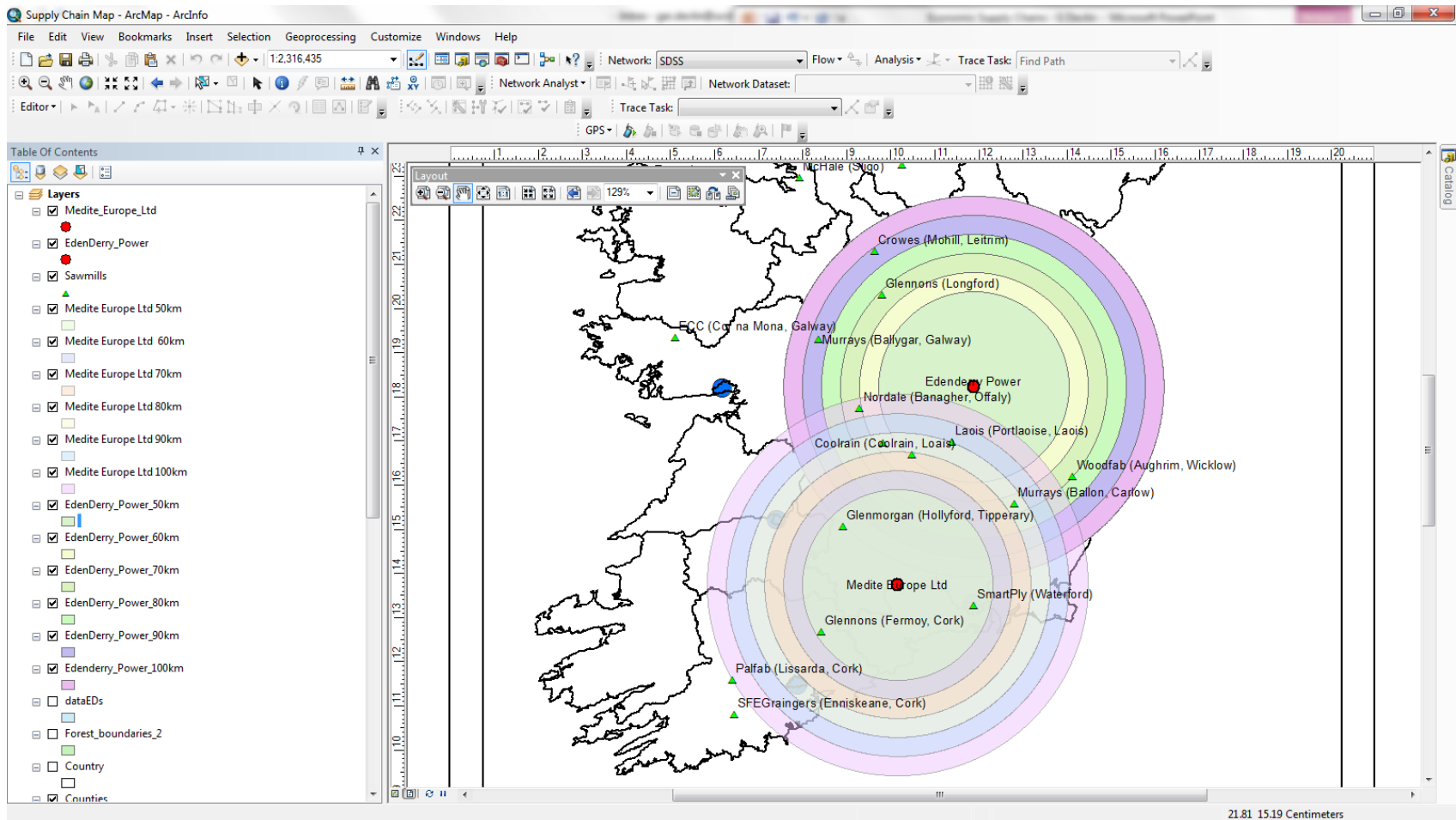


Residues for Medite

MILL_NAME	Chip Prod. (m3)	Chip Prod (wet tonnes)	DIST TO MEDITE
Balcas (Enniskillen, Fermanagh)	192,500	211,750	220
Coolrain (Coolrain, Loais)	31,500	34,650	70
Crowes (Mohill, Leitrim)	7,000	7,700	180
Doherty (Cloghan, Donegal)	63,000	69,300	280
Drenagh (Limavaddy, Derry)	105,000	115,500	310
ECC (Cor na Mona, Galway)	14,000	15,400	180
Glenmorgan (Hollyford, Tipperary)	28,000	30,800	50
Glennons (Fermoy, Cork)	70,000	77,000	50
Glennons (Longford)		0	160
Laois (Portlaoise, Laois)	7,000	7,700	70
McHale (Sligo)	38,500	42,350	220
Murrays (Ballon, Carlow)	2,800	3,080	80
Murrays (Ballygar, Galway)	84,000	92,400	70
Nordale (Banagher, Offaly)	31,500	34,650	100
Palfab (Lissarda, Cork)	122,500	134,750	110
Raudon Teo (Fintown, Donegal)	7,000	7,700	280
SFEGraingers (Enniskeneane, Cork)	5,250	5,775	110
T&J Standish (nr Leap Castle, Offaly)	3,500	3,850	70
Woodfab (Aughrim, Wicklow)	10,500	11,550	110
	823550.00	905905.00	396550.00

- 8 mills between 50 – 100km.
- 3 more at the 110km that currently deliver.
- 396,550 m³ available.
- 356,895 wet tonnes available.
- SmartPly only uses Pulp for WBP.

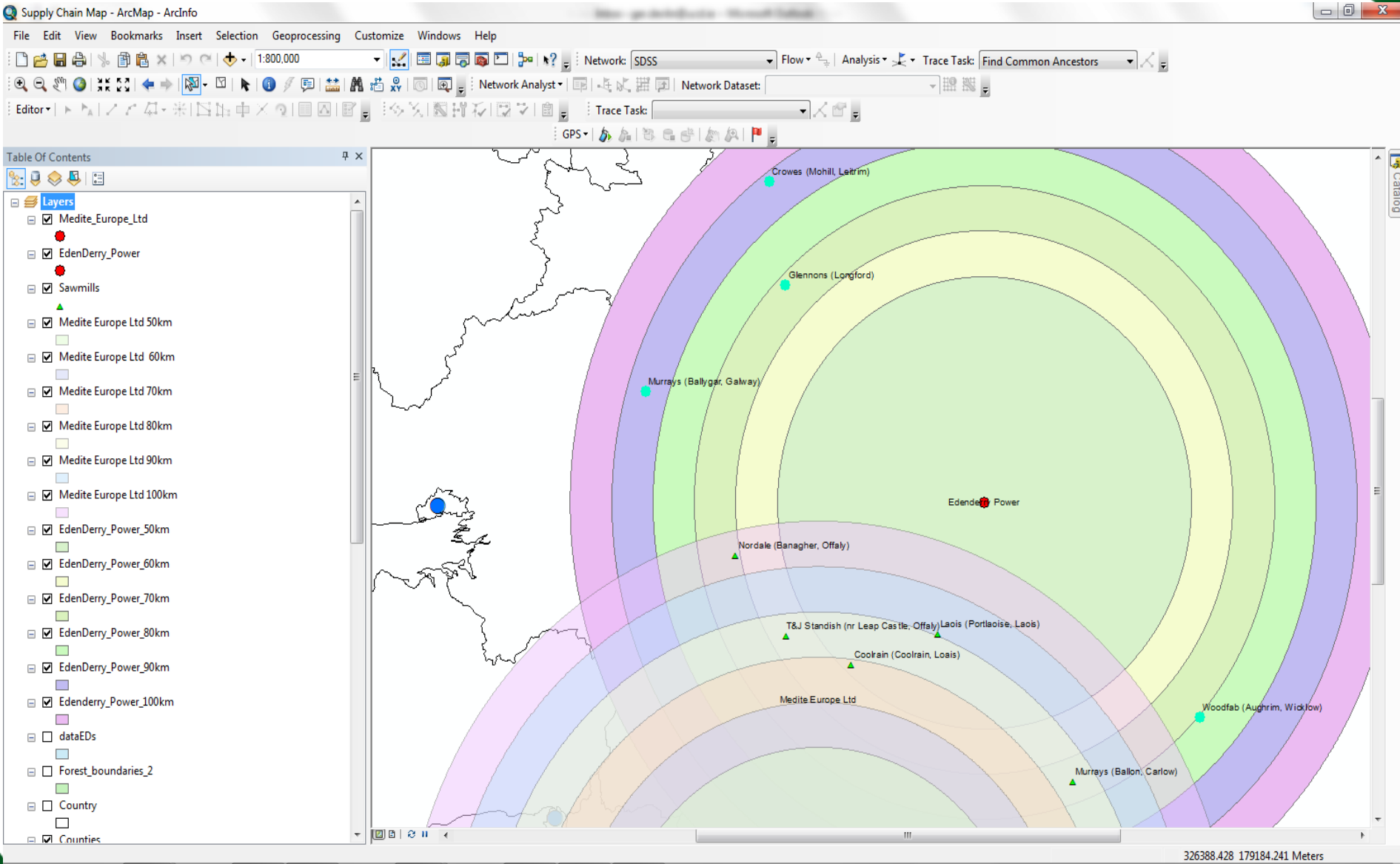
Medite / Edenderry Overlap



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What is the overlap?

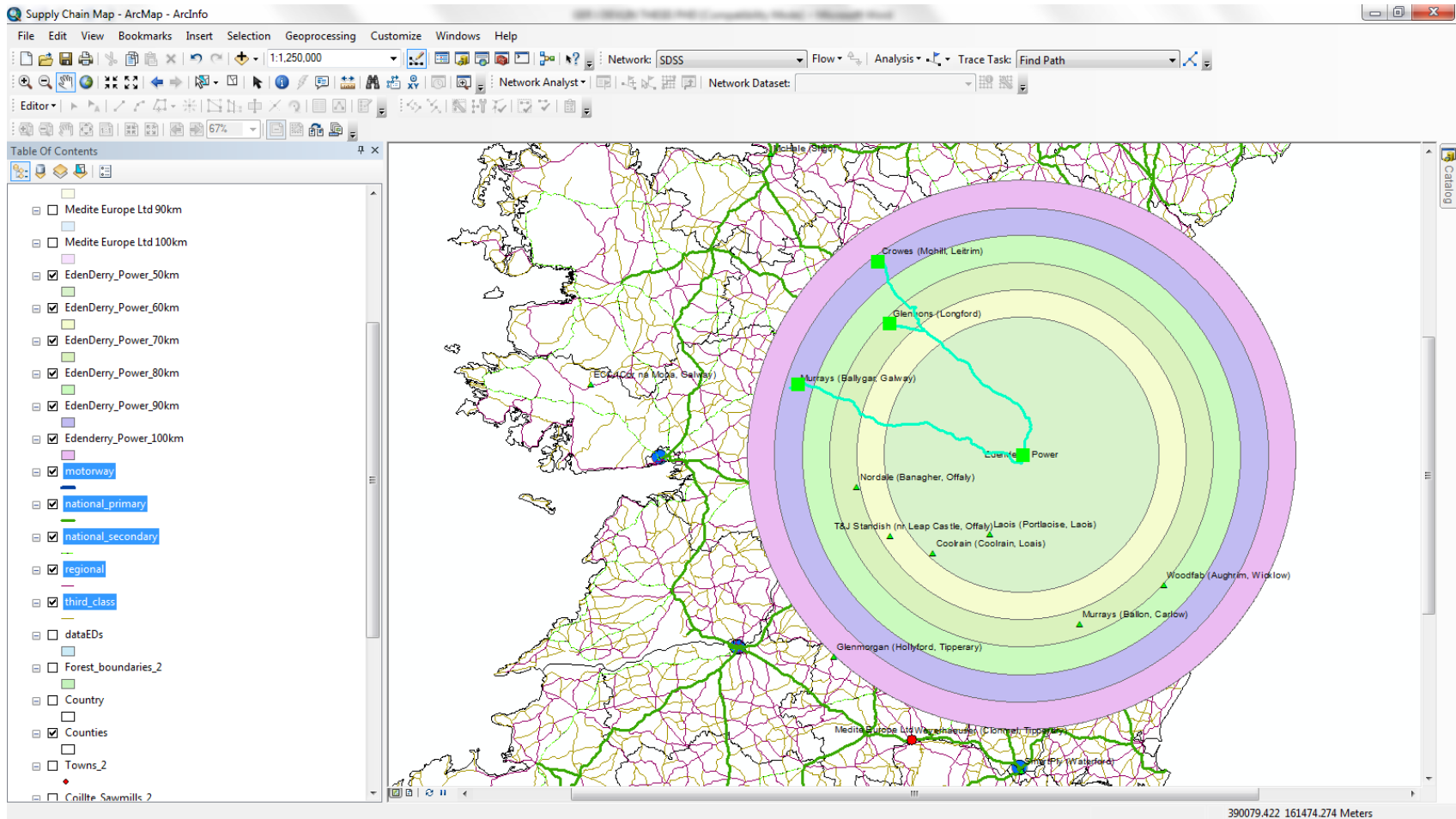
- 7 out of 10 of Edenderry's catchment area mills deliver to Medite.
- 100,100 wet tonnes still achievable from remaining 3 mills
 - 2015 targets still possible.
- Also – Woodfab Mill within 80km of Edenderry and 110km of Medite
 - 11,500 wet tonnes available there if re-diverted.



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MILL_NAME	Chip Prod. (m3)	Chip Prod (wet tonnes)	DIST TO EDENDERRY	DIST TO MEDITE
Balcas (Enniskillen, Fermanagh)	192,500	211,750	130	220
Coolrain (Coolrain, Loais)	31,500	34,650	50	70
Crowes (Mohill, Leitrim)	7,000	7,700	90	180
Doherty (Cloghan, Donegal)	63,000	69,300	190	280
Drenagh (Limavaddy, Derry)	105,000	115,500	200	310
ECC (Cor na Mona, Galway)	14,000	15,400	160	180
Glenmorgan (Hollyford, Tipperary)	28,000	30,800	100	50
Glennons (Fermoy, Cork)	70,000	77,000	160	50
Glennons (Longford)		0	70	160
Laois (Portlaoise, Laois)	7,000	7,700	50	70
McHale (Sligo)	38,500	42,350	150	220
Murrays (Ballon, Carlow)	2,800	3,080	70	80
Murrays (Ballygar, Galway)	84,000	92,400	90	140
Nordale (Banagher, Offaly)	31,500	34,650	70	100
Palfab (Lissarda, Cork)	122,500	134,750	200	110
Raudon Teo (Fintown, Donegal)	7,000	7,700	190	280
SFEGraingers (Enniskeane, Cork)	5,250	5,775	220	110
T&J Standish (nr Leap Castle, Offaly)	3,500	3,850	60	70
Woodfab (Aughrim, Wicklow)	10,500	11,550	80	110
	823550	905905	205800	396550
			100100	

What are Transport Costs?



Real Distance VS Buffer Distance

MILL_NAME	Chip Prod. (m3)	Chip Prod (wet tonnes)	DIST TO EDENDERRY	ROAD DIST
Balcas (Enniskillen, Fermanagh)	192,500	211,750	130	
Coolrain (Coolrain, Laois)	31,500	34,650	50	
Crowes (Mohill, Leitrim)	7,000	7,700	90	106.91
Doherty (Cloghan, Donegal)	63,000	69,300	190	
Drenagh (Limavaddy, Derry)	105,000	115,500	200	
ECC (Cor na Mona, Galway)	14,000	15,400	160	
Glenmorgan (Hollyford, Tipperary)	28,000	30,800	100	
Glennons (Fermoy, Cork)	70,000	77,000	160	
Glennons (Longford)		0	70	84.02
Laois (Portlaoise, Laois)	7,000	7,700	50	
McHale (Sligo)	38,500	42,350	150	
Murrays (Ballon, Carlow)	2,800	3,080	70	
Murrays (Ballygar, Galway)	84,000	92,400	90	106.95
Nordale (Banagher, Offaly)	31,500	34,650	70	
Palfab (Lissarda, Cork)	122,500	134,750	200	
Raudon Teo (Fintown, Donegal)	7,000	7,700	190	
SFEGraingers (Enniskeane, Cork)	5,250	5,775	220	
T&J Standish (nr Leap Castle, Offaly)	3,500	3,850	60	
Woodfab (Aughrim, Wicklow)	10,500	11,550	80	

Delivery Rate Allowed

- EU Working Time Directive
- Regulation (EC) No. 561/2006
 - Longest driving period is **4.5 hrs.**
 - Must take un-interrupted break of 45 mins.
 - OR
 - An initial 15 min break followed by 30 min break during the 4.5 hr drive.
 - Max. drive time per day is **9 hrs** (extended to **10 hrs** at most twice per wk).
 - Max. drive time per wk is **56 hrs**
 - Cannot exceed **90 hrs** in 2 consecutive wks (**56hrs + 34hrs**).

Daily Delivery Rate?

Need to know trip distance

	Avg Travel Speeds (km/h)	Travel Times - Murrays (hrs)	Travel Times - Crowes (hrs)	Travel Times - Glennons (hrs)
Motorway	84.57	-		
National Primary	71.59	0.39	0.64	0.84
National Secondary	48.95	0.23		0.00
Regional	53.85	0.48	0.56	0.45
Third Class	30	1.41	1.04	0.00
One way trip (hrs)		2.50	2.24	1.28
Round Trip (hrs)		5.01	4.47	2.57
No of trips per day		2.00	2.00	3.00
Total Time per day (hrs)		10.01	8.94	7.71

- Average travel speeds recorded from GPS instrumented trucks.
- GPS pts overlaid onto GIS Irish Road Network.
- GPS data analysed for each of the 5 sections of road to get average travel speeds.

Delivery Costs 50% MC

8.38 GJ / T

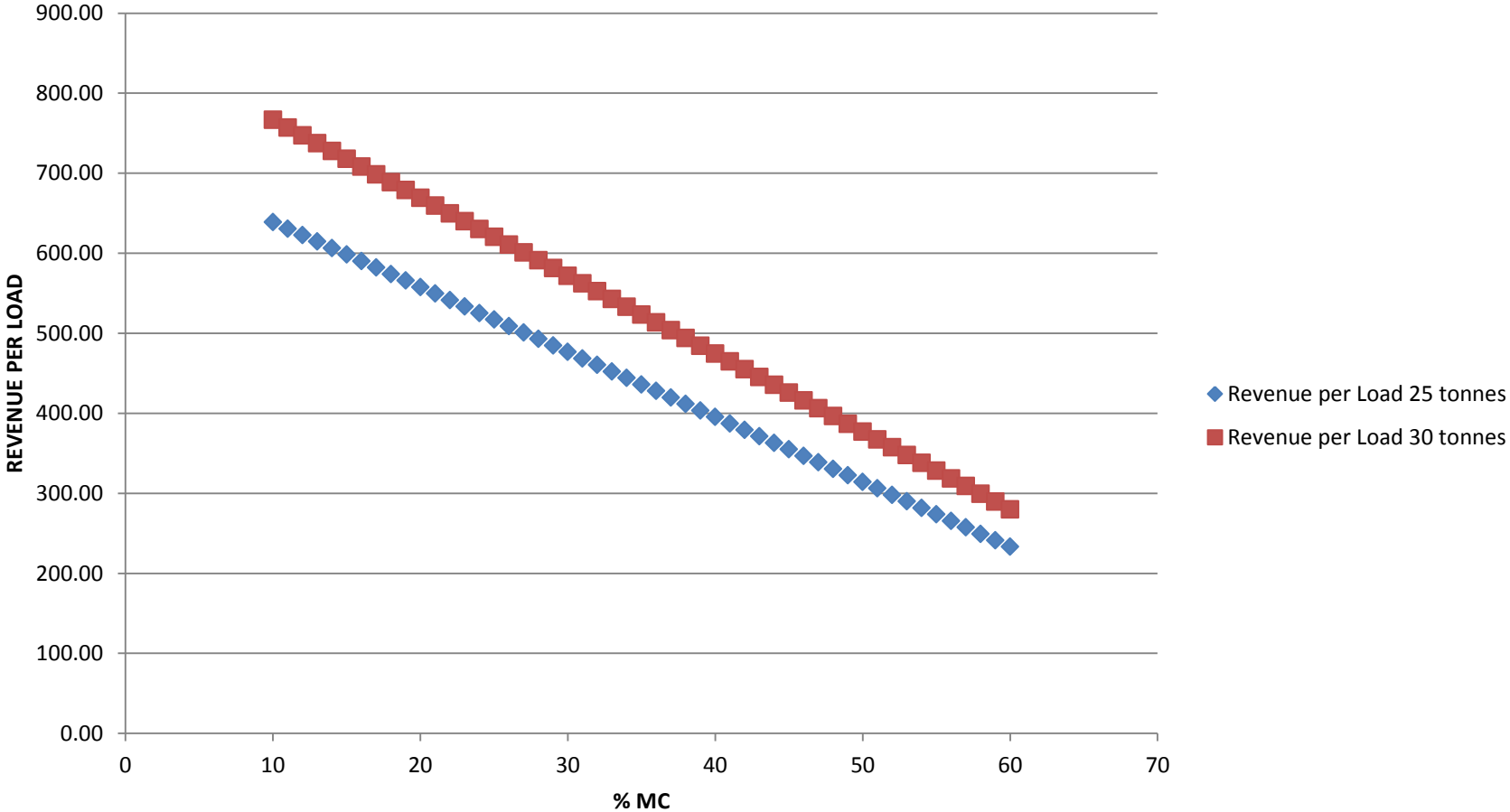
	Dist - Murrays (km)	Dist - Crowes (km)	Dist - Glennons (km)
Total Loads per day	2.00	2.00	3.00
Average Tonnage per load	30.00	30.00	30.00
Average Tonnage per day	60.00	60.00	90.00
Average litre / ton	3.06	3.06	3.06
Diesel Consumption / day	183.60	183.60	275.40
Cost per day (€1.59 / litre)	291.92	291.92	437.89
€10 per ton	600.00	600.00	900.00
NCV per Load - 50% MC	251.40	251.40	251.40
NCV per day	502.80	502.80	754.20
€1.50 per GJ for transport	754.20	754.20	1131.30
% Running Costs (diesel only)	39%	39%	39%

Delivery Costs 30% MC

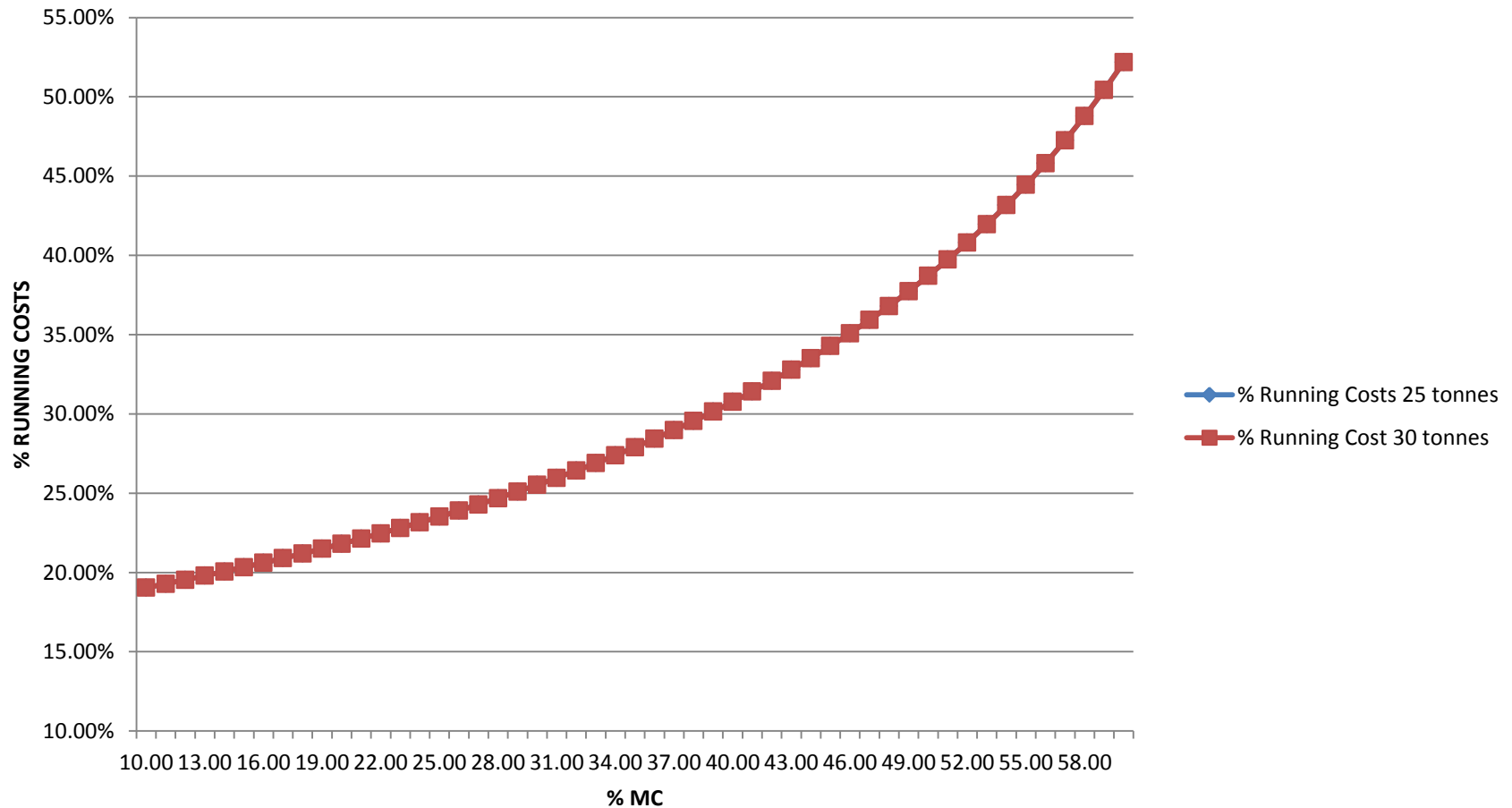
12.71 GJ / T

	Dist - Murrays (km)	Dist - Crowes (km)	Dist - Glennons (km)
Total Loads per day	2.00	2.00	3.00
Average Tonnage per load	30.00	30.00	30.00
Average Tonnage per day	60.00	60.00	90.00
Average litre / ton	3.06	3.06	3.06
Diesel Consumption / day	183.60	183.60	275.40
Cost per day (€1.59 / litre)	291.92	291.92	437.89
€10 per ton	600.00	600.00	900.00
NCV per Load - 30% MC	381.24	381.24	381.24
NCV per day	762.48	762.48	1143.72
€1.50 per GJ for transport	1143.72	1143.72	1715.58
% Running Costs (diesel only)	26%	26%	26%

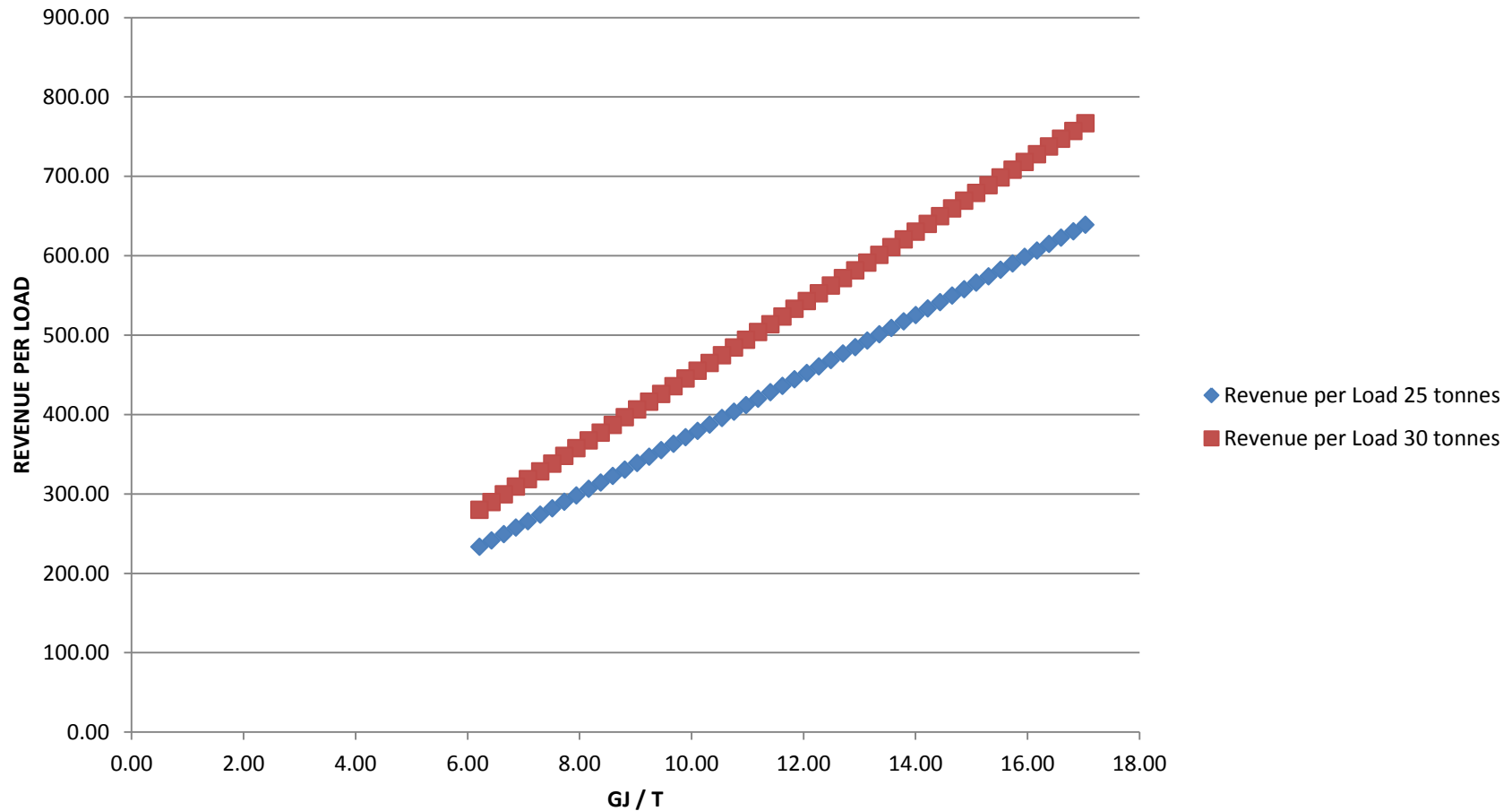
Revenue per load VS % MC



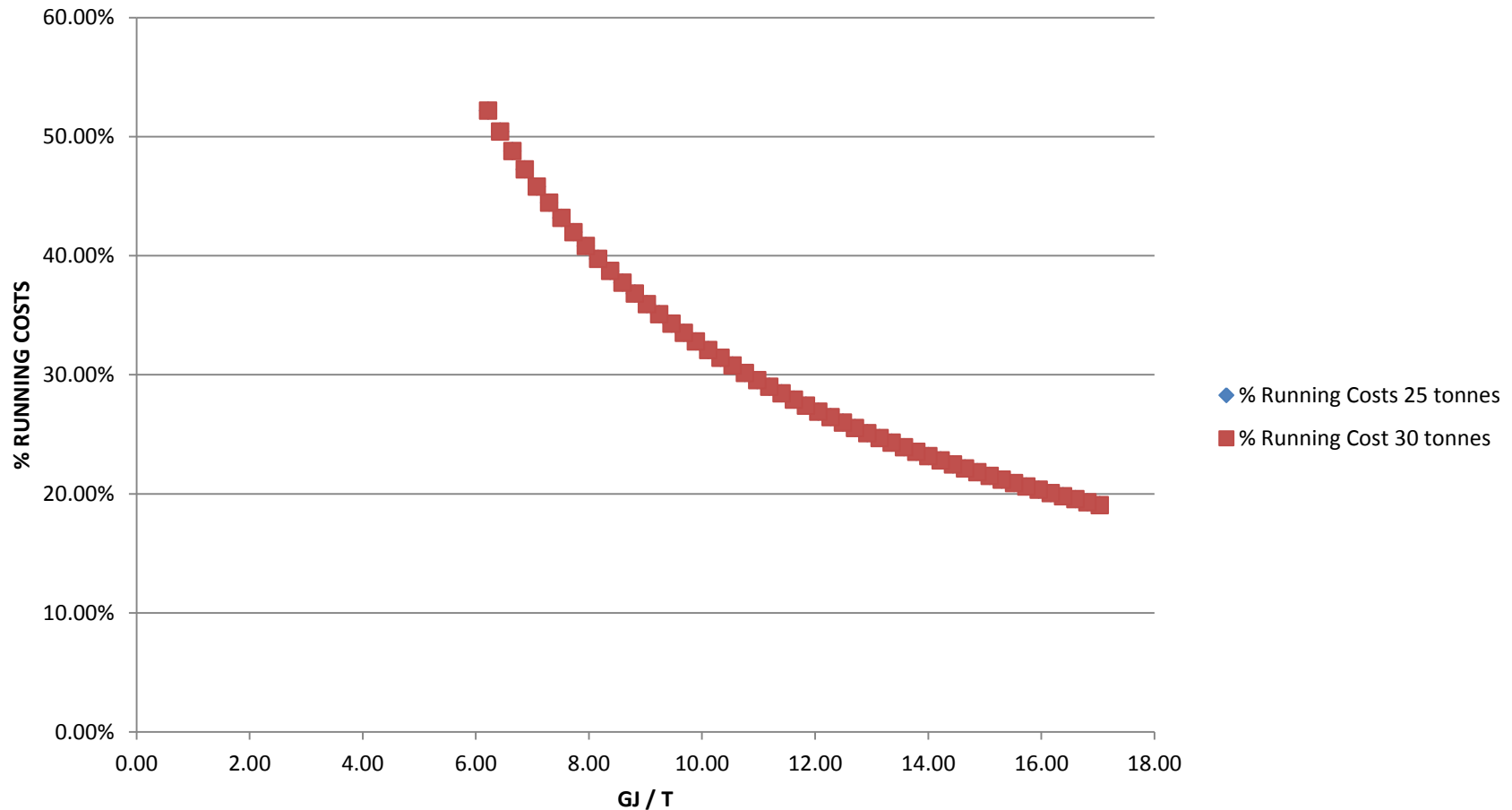
% Running Costs VS % MC (effectively the same)



Revenue per load VS GJ/T



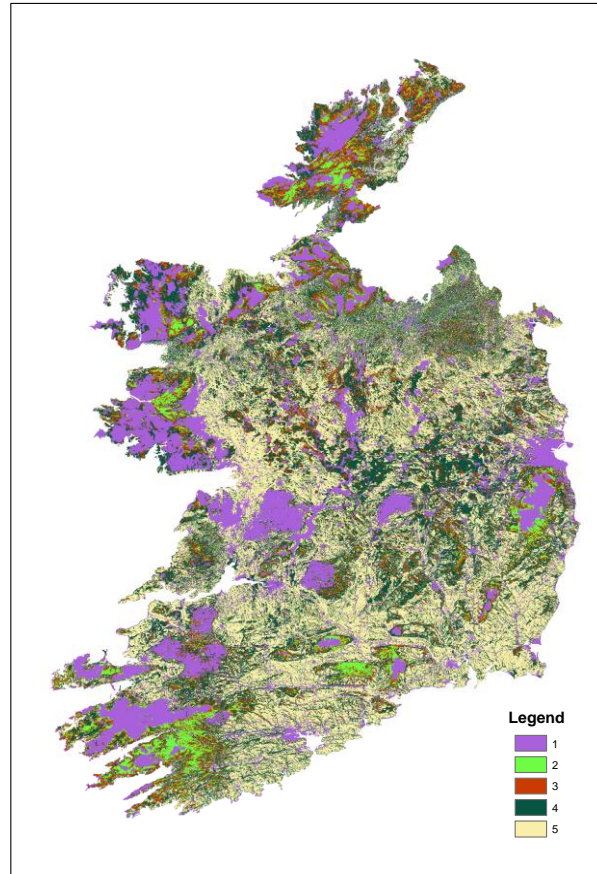
% Running Costs VS GJ/T (effectively the same)



Future Projections

- Willow
 - 800 ha currently planted in Ireland.
 - Yields 10 ODT/hectare/annum on good soils.
 - 8000 tonnes potentially available.
 - Looking for 40,000 tonnes in 2015.
 - 100,000 tonnes in 2020.
- BNM establishing 1000 acres of willow in 2012 to help meet demand.

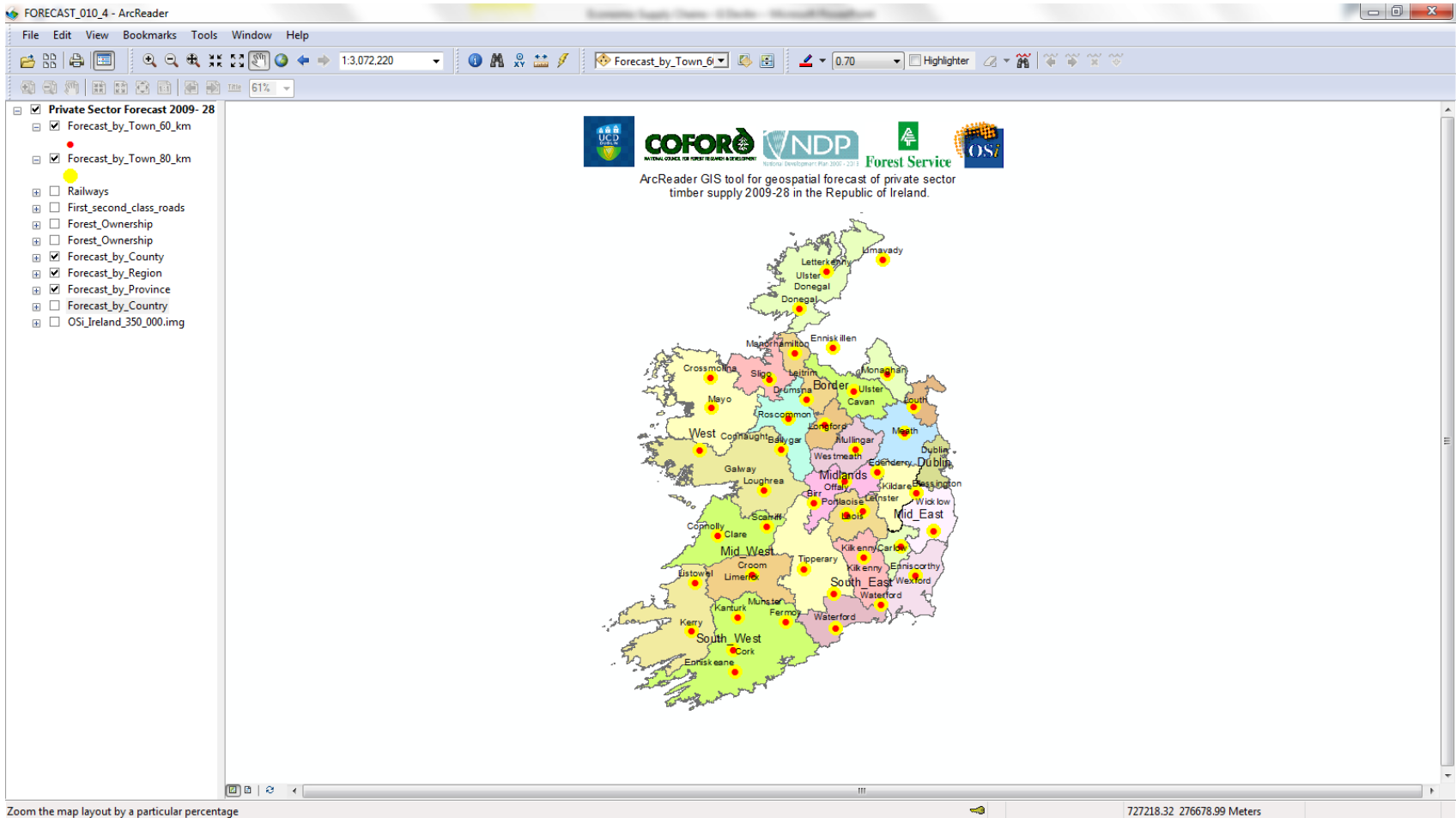
Willow Suitability GIS Map



Private Forest Forecast

- Geospatial forecast shows
 - 8 fold increase in roundwood from private estate.
 - 0.38 million m³ in 2009 – 2.95 million m³ in 2028.
 - Coillte estimate 80,000 – 150,000 tonnes / year from forest residues.
 - Potential energy volume from private estate is shown ...

Private Forest Forecast GIS Map



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Innovative Supply Chains?

- BNM operate 850 km of rail network.
- Traditionally rail has needed distance and payload to compete with road.
- BNM deliver 16 trainloads of peat each day to 3 peat stations.
- So the use of rail to transport biomass might be viable?

FMU's

- Light weight trains pioneered in Germany and Australia maybe an alternative.
 - FREIGHT MULTIPLE UNITS (FMU)
- 118 tonnes tare weight.
- 160 tonnes payload.
- Half the weight of most freight trains.
- Tests in Wales on forest products proven viable.

FMU in Wales



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Thank You...

Dr. Ger Devlin
Biosystems Engineering
University College Dublin
Belfield
Dublin 4
Ireland
ger.devlin@ucd.ie



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