### Vehicle Routing - 5 Cities

### With Capacity Constraint and No Time Constraint

Cost of Goods Delivery (All Trip From(City) - To (City)  Dist			ne(Hours) Qua	antity
'Dublin' -> 'Cork'	218	100	2.18	117
'Cork' -> 'Waterford'	100	100	1.00	70
'Waterford' -> 'Dublin'	133	100	1.33	0
Quantity Delivered : 187				
Distance Covered : 451				
Number of Stops in Trip: 3				
TRIP				
'Dublin' -> 'Galway'	187	100	1.87	42
'Galway' -> 'Limerick'	73	100	0.73	128
'Limerick' -> 'Cork'	86	100	0.86	117
'Cork' -> 'Waterford'	100	100	1.00	70
'Waterford' -> 'Dublin'	133	100	1.33	0
Quantity Delivered : 357				
Distance Covered : 579				
Number of Stops in Trip: 5				
TRIP				
'Dublin' -> 'Waterford'	133	60	2.22	70
'Waterford' -> 'Dublin'	133	100	1.33	0
Quantity Delivered : 70				
Distance Covered : 266				
Number of Stops in Trip: 2				

Figure 1: Goods Delivery Optimal Cost: With Capacity Constraint - Run1

Cost of Goods Delivery From(City) - To (City)				e(Hours) Qu 	antity
'Dublin' -> 'Galway'	1	187	100	1.87	46
'Galway' -> 'Cork'	İ	158	100	1.58	155
'Cork' -> 'Limeric	k'	86	100	0.86	85
'Limerick' -> 'Waterfo	rd'	111	100	1.11	54
'Waterford' -> 'Dublin'	İ	133	100	1.33	0
Quantity Delivered	: 340		·	•	
Distance Covered	: 675				
Number of Stops in Trip	: 5				

Figure 2: Goods Delivery Optimal Cost: With Capacity Constraint - Run2

Cost of Goods Delivery (All Trips From(City) - To (City)  Dista			me(Hours) Qu	antity
'Dublin' -> 'Cork'	218	100	2.18	190
'Cork' -> 'Waterford'	100	100	1.00	71
'Waterford' -> 'Dublin'	133	100	1.33	0
Quantity Delivered : 261				
Distance Covered : 451				
Number of Stops in Trip: 3				
TRIP				
'Dublin' -> 'Galway'	187	100	1.87	40
'Galway' -> 'Limerick'	73	100	0.73	84
'Limerick' -> 'Cork'	86	60	1.43	190
'Cork' -> 'Waterford'	100	100	1.00	71
'Waterford' -> 'Dublin'	133	100	1.33	0
Quantity Delivered : 385 Distance Covered : 579 Number of Stops in Trip: 5	·		·	

Figure 3: Goods Delivery Optimal Cost : With Capacity Constraint - Run3

#### With Capacity Constraint and Time Constraint

Cost of Goods Delivery (All Tri From(City) - To (City)  Dis			e(Hours) Qu	antity
'Dublin' -> 'Cork'		100	2.18	134
'Cork' -> 'Dublin'	218	100	2.18	0
Quantity Delivered : 134				
Distance Covered : 436				
Number of Stops in Trip: 2TRIP				
'Dublin' -> 'Limerick'	175	100	1.75	106
'Limerick' -> 'Dublin'	175	60	2.92	0
Quantity Delivered : 106				
Distance Covered : 350				
Number of Stops in Trip: 2				
TRIP				
'Dublin' -> 'Galway'	187	100	1.87	48
'Galway' -> 'Dublin'	187	100	1.87	0
Quantity Delivered : 48				
Distance Covered : 374				
Number of Stops in Trip: 2				
TRIP				
'Dublin' -> 'Waterford'	133	60	2.22	54
'Waterford' -> 'Dublin'	133	100	1.33	0
Quantity Delivered : 54				
Distance Covered : 266				
Number of Stops in Trip: 2				

Figure 4: Goods Delivery Optimal Cost : With Capacity Constraint and Time Constraint

# Vehicle Routing - 20 Cities

With Capacity Constraint and No Time Constraint

			Trips) : 132  Distance(KM)		Time(Hours)	Quantity
'Dublin'	->	'Naas'	   31	100	0.31	21
'Naas'	->	'Bray'	38	100	0.38	35
'Bray'	->	'Swords'	27	100	0.27	15
'Swords'	->	'Drogheda'	31	100	0.31	38
'Drogheda'	->	'Dundalk'	33	100	0.33	31
'Dundalk'	->	'Navan'	43	100	0.43	23
'Navan'	->	'Athlone'	87	100	0.87	13
'Athlone'	->	'Sligo'	101	100	1.01	18
'Sligo'	->	'Galway'	117	100	1.17	96
'Galway'	->	'Ennis'	46	100	0.46	28
'Ennis'	->	'Limerick'	32	100	0.32	74
'Limerick'	->	'Tralee'	85	100	0.85	18
'Tralee'	->	'Cork'	95	100	0.95	252
'Cork'	->	'Waterford'	100	100	1.00	38
'Waterford'	->	'Clonmel'	41	100	0.41	17
'Clonmel'	->	'Kilkenny'	45	100	0.45	28
'Kilkenny'	->	'Wexford'	63	100	0.63	21
'Wexford'	->	'Carlow'	63	100	0.63	10
'Carlow'	->	'Newbridge'	38	100	0.38	11
'Newbridge'	->	'Dublin'	40	100	0.40	0
Quantity De	liv	ered : 78	7			
Distance Co	ver	ed : 11	56			
Number of S	top	s in Trip: 20				

Figure 5: Goods Delivery Optimal Cost : With Capacity Constraint - Run1

		•	Trips): 128		Time (Heure)	10antitu
From(City)		Го (City) 	Distance(KM) 	Speed(KMH)  	lime(Hours) 	Quantity
'Dublin'	->	'Swords'	13	60	0.22	12
'Swords'	->	'Navan'	38	100	0.38	12
'Navan'	->	'Drogheda'	22	100	0.22	42
'Drogheda'	->	'Dundalk'	33	100	0.33	39
'Dundalk'	->	'Sligo'	137	100	1.37	12
'Sligo'	->	'Athlone'	101	100	1.01	12
'Athlone'	->	'Galway'	75	100	0.75	76
'Galway'	->	'Ennis'	46	100	0.46	15
'Ennis'	->	'Tralee'	81	100	0.81	28
'Tralee'	->	'Limerick'	85	100	0.85	119
'Limerick'	->	'Cork'	86	100	0.86	244
'Cork'	->	'Clonmel'	72	100	0.72	23
'Clonmel'	->	'Waterford'	41	100	0.41	35
'Waterford'	->	'Wexford'	45	60	0.75	11
'Wexford'	->	'Kilkenny'	63	100	0.63	13
'Kilkenny'	->	'Carlow'	30	100	0.30	20
'Carlow'	->	'Newbridge'	38	100	0.38	14
'Newbridge'	->	'Naas'	9	100	0.09	14
'Naas'	->	'Bray'	38	100	0.38	35
'Bray'	->	'Dublin'	16	100	0.16	0
Quantity De	liv	ered : 77	6			
Distance Co	ver	ed : 10	69			

Figure 6: Goods Delivery Optimal Cost : With Capacity Constraint - Run2

Number of Stops in Trip: 20

'Newbridge' -> 'Carlow'   38   100   0.38   29   100   0.30   29   100   0.30   29   100   0.30   29   100   0.30   29   100   0.30   29   100   0.45   50   100   0.32   20   100   0.32   20   100   0.32   20   100   0.46   60   100   0.46   100   0.46   100   0.46   100   0.46   100   0.46   100   0.46   100   0.46   100   0.46   100	Dublin'	->	'Naas'	31	100	0.31	22
'Carlow' -> 'Kilkenny'   30   100   0.30   24   100   0.63   25   100   0.63   25   100   0.63   25   100   0.63   25   100   0.45   56   100   0.45   56   100   0.45   56   100   0.41   100   0.41   100   0.41   100   0.41   100   0.72   205   100   0.72   205   100   0.72   205   100   0.72   205   100   0.72   205   100   0.85   114   100   0.85   114   100   0.85   114   100   0.85   115   100   0.85   115   100   0.32   25   100   0.32   25   100   0.32   25   100   0.75   15   100   0.75   15   100   0.75   15   100   0.75   15   100   0.75   15   100   0.75   15   100   0.75   15   100   0.75   15   100   0.33   100   0.33   100   0.33   100   0.33   100   0.33   100   0.33   100   0.33   100   0.35   10	Naas′	->	'Newbridge'	9	100 j	0.09	12
'Kilkenny' -> 'Wexford'	Newbridge'	->	'Carlow'	38	100	0.38	25
'Wexford'       -> 'Waterford'       45       100       0.45       56         'Waterford'       -> 'Clonmel'       41       100       0.41       0.42       0.44	Carlow'	->	'Kilkenny'	30	100	0.30	24
'Waterford' -> 'Clonmel'	Kilkenny′	->	'Wexford'	63	100	0.63	25
'Clonmel'       -> 'Cork'       72       100       0.72       203         'Cork'       -> 'Tralee'       95       100       0.95       29         'Tralee'       -> 'Limerick'       85       100       0.85       11         'Limerick'       -> 'Ennis'       32       100       0.32       29         'Ennis'       -> 'Galway'       46       100       0.46       60         'Galway'       -> 'Athlone'       75       100       0.75       10         'Athlone'       -> 'Sligo'       101       100       1.01       29         'Sligo'       -> 'Dundalk'       137       100       1.37       20         'Dundalk'       -> 'Drogheda'       33       100       0.33       40         'Drogheda'       -> 'Navan'       22       100       0.22       12         'Navan'       -> 'Swords'       38       100       0.38       30         'Swords'       -> 'Bray'       27       100       0.27       29         'Bray'       -> 'Dublin'       16       100       0.16       0.16	Wexford'	->	'Waterford'	45	100	0.45	56
'Cork'       -> 'Tralee'       95       100       0.95       25         'Tralee'       -> 'Limerick'       85       100       0.85       11         'Limerick'       -> 'Ennis'       32       100       0.32       25         'Ennis'       -> 'Galway'       46       100       0.46       65         'Galway'       -> 'Athlone'       75       100       0.75       12         'Athlone'       -> 'Sligo'       101       100       1.01       25         'Sligo'       -> 'Dundalk'       137       100       1.37       26         'Dundalk'       -> 'Drogheda'       33       100       0.33       44         'Drogheda'       -> 'Navan'       22       100       0.22       12         'Navan'       -> 'Swords'       38       100       0.38       36         'Swords'       -> 'Bray'       27       100       0.27       25         'Bray'       -> 'Dublin'       16       100       0.16       0.16	Waterford'	->	'Clonmel'	41	100	0.41	9
'Tralee' -> 'Limerick' 85   100   0.85   114 'Limerick' -> 'Ennis' 32   100   0.32   24 'Ennis' -> 'Galway' 46   100   0.46   66 'Galway' -> 'Athlone' 75   100   0.75   18 'Athlone' -> 'Sligo' 101   100   1.01   28 'Sligo' -> 'Dundalk' 137   100   1.37   26 'Dundalk' -> 'Drogheda' 33   100   0.33   44 'Drogheda' -> 'Navan' 22   100   0.22   18 'Navan' -> 'Swords' 38   100   0.38   36 'Swords' -> 'Bray' 27   100   0.27   28 'Bray' -> 'Dublin' 16   100   0.16	Clonmel'	->	'Cork'	72	100	0.72	208
'Limerick' -> 'Ennis'   32   100   0.32   26   100   0.46   66   100   0.46   66   100   0.46   67   100   0.75   120	Cork'	->	'Tralee'	95	100	0.95	25
'Ennis' -> 'Galway'   46   100   0.46   6' 'Galway' -> 'Athlone'   75   100   0.75   16' 'Athlone' -> 'Sligo'   101   100   1.01   26' 'Sligo' -> 'Dundalk'   137   100   1.37   26' 'Dundalk' -> 'Drogheda'   33   100   0.33   46' 'Drogheda' -> 'Navan'   22   100   0.22   16' 'Navan' -> 'Swords'   38   100   0.38   36' 'Swords' -> 'Bray'   27   100   0.27   26' 'Bray' -> 'Dublin'   16   100   0.16	Tralee'	->	'Limerick'	85	100	0.85	114
'Galway' -> 'Athlone'   75   100   0.75   12   14   15   15   16   16   17   18   18   18   18   18   18   18	Limerick'	->	'Ennis'	32	100	0.32	29
'Athlone'       -> 'Sligo'       101       100       1.01       29         'Sligo'       -> 'Dundalk'       137       100       1.37       20         'Dundalk'       -> 'Drogheda'       33       100       0.33       40         'Drogheda'       -> 'Navan'       22       100       0.22       12         'Navan'       -> 'Swords'       38       100       0.38       30         'Swords'       -> 'Bray'       27       100       0.27       25         'Bray'       -> 'Dublin'       16       100       0.16       0	Ennis'	->	'Galway'	46	100	0.46	67
'Sligo' -> 'Dundalk'   137   100   1.37   20 'Dundalk' -> 'Drogheda'   33   100   0.33   40 'Drogheda' -> 'Navan'   22   100   0.22   10 'Navan' -> 'Swords'   38   100   0.38   30 'Swords' -> 'Bray'   27   100   0.27   20 'Bray' -> 'Dublin'   16   100   0.16	Galway′	->	'Athlone'	75	100	0.75	18
'Dundalk' -> 'Drogheda'   33   100   0.33   44   100   0.22   12   12   12   12   13   14   15   15   15   15   15   15   15	Athlone'	->	'Sligo'	101	100	1.01	25
'Drogheda' -> 'Navan'   22   100   0.22   13 'Navan' -> 'Swords'   38   100   0.38   36 'Swords' -> 'Bray'   27   100   0.27   29 'Bray' -> 'Dublin'   16   100   0.16	Sligo′	->	'Dundalk'	137	100	1.37	26
'Navan' -> 'Swords'   38   100   0.38   30 'Swords' -> 'Bray'   27   100   0.27   29 'Bray' -> 'Dublin'   16   100   0.16	Dundalk'	->	'Drogheda'	33	100	0.33	40
'Swords' -> 'Bray'   27   100   0.27   29   29   27   29   27   29   29	Drogheda′	->	'Navan'	22	100	0.22	11
'Bray' -> 'Dublin'   16   100   0.16	Navan'	->	'Swords'	38	100	0.38	30
	Swords'	->	'Bray'	27	100	0.27	25
Quantity Delivered : 791	Bray'	->	'Dublin'	16	100	0.16	9
	uantity De	live	ered : 791	•			

Figure 7: Goods Delivery Optimal Cost: With Capacity Constraint - Run3

#### With Capacity Constraint and Time Constraint

Cost of Goods Delivery (All From(City) - To (City)	Distance(KM)	Speed(KMH)		
'Dublin' -> 'Cork'   'Cork' -> 'Dublin'   Quantity Delivered : 256 Distance Covered : 436				
"		60     60	2.92 2.92	76   0
'Dublin' -> 'Galway'   'Galway' -> 'Dublin'   Quantity Delivered :52 Distance Covered :374 Number of Stops in Trip: 2TRIP 'Dublin' -> 'Waterford'		100     60		
'Waterford' -> 'Dublin'   Quantity Delivered : 32 Distance Covered : 266	133	100     100		
		100     100		
	16 16	100     60		
TRIP 'Dublin' -> 'Drogheda'   'Drogheda' -> 'Dublin'   Quantity Delivered : 23 Distance Covered : 88 Number of Stops in Trip: 2TRIP		100     100		
TRIP 'Dublin' -> 'Swords'   'Swords' -> 'Dublin'   Quantity Delivered : 17 Distance Covered : 26 Number of Stops in Trip: 2TRIP		60     100		
TRIP 'Dublin' -> 'Tralee'   'Tralee' -> 'Dublin'   Quantity Delivered : 13 Distance Covered : 522 Number of Stops in Trip: 2TRIP	2	100     100		
TRIP 'Dublin' -> 'Kilkenny'   'Kilkenny' -> 'Dublin'   [Quantity Delivered : 21 Distance Covered : 200 Number of Stops in Trip: 2TRIP	•	60     100		
TRIP 'Dublin' -> 'Ennis'   'Ennis' -> 'Dublin'   Quantity Delivered : 14 Distance Covered : 380 Number of Stops in Trip: 2TRIP	)	60     100		
TRIP 'Dublin' -> 'Sligo'   'Sligo' -> 'Dublin'   Quantity Delivered : 22 Distance Covered : 360 Number of Stops in Trip: 2	180 180	100     100	1.80 1.80	22

Figure 8: Goods Delivery Optimal Cost : With Capacity Constraint and Time Constraint

## Vehicle Routing - 30 Cities

## With Capacity Constraint and No Time Constraint

Dublin	-> Leixlip	16	100	0.16	13
Leixlip	-> Celbridge	j 5 j	100	0.05	13
Celbridge	-> Maynooth	6	100	0.06	10
Maynooth	-> Navan	j 31 j	100	0.31	23
Navan	-> Drogheda	j 22 j	100	0.22	1
Drogheda	-> Dundalk	j 33 j	100	0.33	4
Dundalk	-> Letterkenny	j 133 j	100	1.33	
Letterkenny	-> Sligo	j 87 j	100	0.87	2
Sligo	-> Mullingar	112	100	1.12	1
Mullingar	-> Tullamore	29	100	0.29	1
Tullamore	-> Athlone	34	100	0.34	2
Athlone	-> Galway	j 75 j	100	0.75	7
Galway	-> Killarney	j 39 j	100	0.39	1
Killarney	-> Ennis	j 41 j	100	0.41	1
Ennis	-> Limerick	j 32 j	60 j	0.53	10
Limerick	-> Tralee	j 85 j	100	0.85	1
Tralee	-> Cork	j 95 j	100	0.95	23
Cork	-> Clonmel	j 72 j	100	0.72	1
Clonmel	-> Waterford	j 41 j	100	0.41	5
Waterford	-> Wexford	j 45 j	100	0.45	1
Wexford	-> Kilkenny	j 63 j	100	0.63	2
Kilkenny	-> Carlow	j 30 j	100	0.30	1
Carlow	-> Port laoise	j 33 j	100	0.33	1
Port laoise	-> Newbridge	j 36 j	100	0.36	1
Newbridge	-> Naas	j 9 j	60	0.15	1
Naas	-> Dublin	31	100	0.31	
Quantity Deliv	ered : 818		•	·	
Distance Cover	ed : 1235				
Number of Stop TRIP	s in Trip: 26				
Dublin	-> Greystones	24	100	0.24	
Greystones	-> Bray	j 8 j	100	0.08	3
Bray	-> Malahide	26	100	0.26	1
Malahide	-> Swords	j 3 j	60	0.05	3
Swords	-> Dublin	13	100	0.13	
Quantity Deliv	ered : 87	•	•	·	
Distance Cover					
Number of Stop	e in Trin. 5				

Figure 9: Goods Delivery Optimal Cost : With Capacity Constraint - Run1

Limerick -> Cork   86   100   0.86   2  Cork -> Clonmel   72   100   0.72    Clonmel -> Waterford   41   100   0.41    Waterford -> Wexford   45   100   0.45    Wexford -> Kilkenny   63   100   0.63    Kilkenny -> Carlow   30   100   0.30    Carlow -> Port laoise   33   100   0.33    Port laoise -> Newbridge   36   100   0.36    Newbridge -> Naas   9   100   0.09    Naas -> Celbridge   15   60   0.25    Celbridge -> Maynooth   6   100   0.06    Maynooth -> Leixlip   7   100   0.07    Leixlip -> Bray   30   100   0.30    Bray -> Greystones   8   100   0.08    Greystones -> Dublin   24   100   0.24	Dublin	->	Malahide	14	100	0.14	8
Navan         -> Drogheda         22         100         0.22           Drogheda         -> Dundalk         33         100         0.33           Dundalk         -> Letterkenny         133         100         1.33           Letterkenny         -> Sligo         87         100         0.87           Sligo         -> Mullingar         112         100         1.12           Mullingar         -> Tullamore         29         100         0.29           Tullamore         -> Athlone         34         100         0.34           Athlone         -> Galway         75         100         0.75           Galway         -> Killarney         39         100         0.39           Killarney         -> Ennis         41         100         0.41           Ennis         -> Tralee         81         100         0.81           Tralee         -> Limerick         85         100         0.85           Limerick         -> Cork         86         100         0.86           Cork         -> Conmel         72         100         0.72           Clonmel         -> Waterford         41         100         0.41	Malahide	->	Swords	3	100 j	0.03	32
Drogheda         -> Dundalk         33   100   0.33             Dundalk         -> Letterkenny         133   100   1.33             Letterkenny         -> Sligo         87   100   0.87             Sligo         -> Mullingar         112   100   1.12             Mullingar         -> Tullamore         29   100   0.29             Tullamore         -> Athlone         34   100   0.34             Athlone         -> Galway         75   100   0.75             Galway         -> Killarney         39   100   0.39             Killarney         -> Ennis         41   100   0.41             Ennis         -> Tralee         81   100   0.81             Tralee         -> Limerick         85   100   0.85             Limerick         -> Cork         86   100   0.86             Cork         -> Clonmel         72   100   0.72             Clonmel         -> Waterford         41   100   0.41             Waterford         45   100   0.45             Wexford         45   100   0.45             Wexford         -> Kilkenny         63   100   0.30             Kilkenny         -> Carlow         30   100   0.33             Carlow         -> Naas         9   100   0.36             Newbridge         -> Naas	Swords	->	Navan	38	100 j	0.38	16
Dundalk         -> Letterkenny         133         100         1.33           Letterkenny         -> Sligo         87         100         0.87           Sligo         -> Mullingar         112         100         1.12           Mullingar         -> Tullamore         29         100         0.29           Tullamore         -> Athlone         34         100         0.34           Athlone         -> Athlone         34         100         0.34           Athlone         -> Galway         75         100         0.75           Galway         -> Killarney         39         100         0.39           Killarney         -> Ennis         41         100         0.41           Ennis         -> Tralee         81         100         0.81           Tralee         -> Limerick         85         100         0.85           Limerick         -> Cork         86         100         0.86         2           Cork         -> Clonmel         72         100         0.72         0.72           Clomel         -> Waterford         41         100         0.45         0.45         0.45         0.45         0.45         0.45	Navan	->	Drogheda	22	100 j	0.22	41
Letterkenny       -> Sligo       87       100       0.87         Sligo       -> Mullingar       112       100       1.12         Mullingar       -> Tullamore       29       100       0.29         Tullamore       -> Athlone       34       100       0.34         Athlone       -> Galway       75       100       0.75         Galway       -> Killarney       39       100       0.39         Killarney       -> Ennis       41       100       0.41         Ennis       -> Tralee       81       100       0.81         Tralee       -> Limerick       85       100       0.85         Limerick       -> Cork       86       100       0.86       2         Cork       -> Clonmel       72       100       0.72       2         Clomel       -> Waterford       41       100       0.41       4         Waterford       -> Waterford       45       100       0.63       4         Kilkenny       -> Carlow       30       100       0.63       4         Kilkenny       -> Carlow       30       100       0.36       0.33         Port laoise       ->	Drogheda	->	Dundalk	33	100 j	0.33	23
Sligo       -> Mullingar       112       100       1.12         Mullingar       -> Tullamore       29       100       0.29         Tullamore       -> Athlone       34       100       0.34         Athlone       -> Galway       75       100       0.75         Galway       -> Killarney       39       100       0.39         Killarney       -> Ennis       41       100       0.41         Ennis       -> Tralee       81       100       0.85         Limerick       -> Limerick       85       100       0.85         Limerick       -> Cork       86       100       0.86       2         Cork       -> Clonmel       72       100       0.72       C         Clomel       -> Waterford       41       100       0.41       Waterford       45       100       0.45       Wexford       45       100       0.45       Wexford       45       100       0.63       Nas       Nas       100       0.30       Nas       Nas       100       0.33       Nas       Nas       Newbridge       36       100       0.36       Nas       Newbridge       36       100       0.09       Nas <td>Dundalk</td> <td>-&gt;</td> <td>Letterkenny</td> <td>133</td> <td>100 j</td> <td>1.33</td> <td>18</td>	Dundalk	->	Letterkenny	133	100 j	1.33	18
Mullingar       -> Tullamore       29       100       0.29         Tullamore       -> Athlone       34       100       0.34         Athlone       -> Galway       75       100       0.75       6         Galway       -> Killarney       39       100       0.39       6       0       0.39       0.41       0.41       0.41       0.41       0.41       0.41       0.41       0.41       0.86       0.85       <	Letterkenny	->	Sligo	87	100 j	0.87	25
Tullamore       -> Athlone       34       100       0.34         Athlone       -> Galway       75       100       0.75         Galway       -> Killarney       39       100       0.39         Killarney       -> Ennis       41       100       0.41         Ennis       -> Tralee       81       100       0.85         Limerick       -> Limerick       85       100       0.86       2         Cork       -> Cork       86       100       0.86       2         Cork       -> Clonmel       72       100       0.72       2         Clonmel       -> Wexford       41       100       0.41       4         Waterford       -> Wexford       45       100       0.45       4         Wexford       -> Kilkenny       63       100       0.63       4         Kilkenny       -> Carlow       30       100       0.30       0.30         Carlow       -> Port laoise       33       100       0.36       0.09         Naw       -> Newbridge       36       100       0.36       0.09         Naas       -> Celbridge       15       60       0.25       0.0	Sligo	->	Mullingar	112	100	1.12	18
Athlone -> Galway 75 100 0.75 Galway -> Killarney 39 100 0.39 Killarney -> Ennis 41 100 0.41 Ennis -> Tralee 81 100 0.85 Limerick -> Cork 85 100 0.86 2 Cork -> Clonmel 72 100 0.41 Waterford -> Waterford 41 100 0.41 Waterford -> Kilkenny 63 100 0.45 Waterford -> Kilkenny 63 100 0.63 Kilkenny -> Carlow 30 100 0.30 Carlow -> Newbridge 36 100 0.33 Port laoise -> Newbridge 36 100 0.36 Newbridge -> Naas 9 100 0.36 Newbridge -> Maynooth -> Leixlip -> Bray 30 100 0.30 Carlow -> Bray 30 100 0.30 Carlow -> Bray 30 100 0.30 Carlow -> Carlow 6 100 0.06 Maynooth -> Leixlip -> Bray 30 100 0.30 Carlow -> Bray 30 100 0.30 Carlow -> Carlow 6 100 0.06 Carlow -> Carlow 9 100 0.07 Carlow 0.06 Carlow -> Carlow 0.06 Carlow 0.06 Carlow 0.06 Carlow 0.06 Carlow 0.06 Carlow 0.07 Carlow 0.06 Carlow 0.07 Carlow 0.07 Carlow 0.07 Carlow 0.07 Carlow 0.07 Carlow 0.07 Carlow 0.07 Carlow 0.07 Carlow 0.07 Carlow 0.07 Carlow 0.07 Carlow 0.07 Carlow 0.07 Carlow 0.07 Carlow 0.07 Carlow 0.07 Carlow 0.07 Carlow 0.07 Carlow 0.08 Carlow 0.0	Mullingar	->	Tullamore	29	100	0.29	16
Galway       -> Killarney       39       100       0.39         Killarney       -> Ennis       41       100       0.41         Ennis       -> Tralee       81       100       0.81         Tralee       -> Limerick       85       100       0.85         Limerick       -> Cork       86       100       0.86       2         Cork       -> Clonmel       72       100       0.72	Tullamore	->	Athlone	34	100	0.34	15
Killarney       -> Ennis       41       100       0.41         Ennis       -> Tralee       81       100       0.81         Tralee       -> Limerick       85       100       0.85         Limerick       -> Cork       86       100       0.86       2         Cork       -> Clonmel       72       100       0.72       100       0.72       0	Athlone	->	Galway	75	100	0.75	63
Ennis -> Tralee   81   100   0.81   Tralee -> Limerick   85   100   0.85   Limerick -> Cork   86   100   0.86   2 Cork -> Clonmel   72   100   0.72   Clonmel -> Waterford   41   100   0.41   Waterford -> Wexford   45   100   0.45   Wexford -> Kilkenny   63   100   0.63   Kilkenny -> Carlow   30   100   0.30   Carlow -> Port laoise   33   100   0.33   Port laoise -> Newbridge   36   100   0.36   Newbridge -> Naas   9   100   0.09   Naas -> Celbridge   15   60   0.25   Celbridge -> Maynooth   6   100   0.06   Maynooth -> Leixlip   7   100   0.07   Leixlip -> Bray   30   100   0.30   Bray -> Greystones   8   100   0.08   Greystones -> Dublin   24   100   0.24	Galway	->	Killarney	39	100	0.39	9
Tralee -> Limerick	Killarney	->	Ennis	41	100	0.41	23
Limerick -> Cork   86   100   0.86   2  Cork -> Clonmel   72   100   0.72    Clonmel -> Waterford   41   100   0.41    Waterford -> Wexford   45   100   0.45    Wexford -> Kilkenny   63   100   0.63    Kilkenny -> Carlow   30   100   0.30    Carlow -> Port laoise   33   100   0.33    Port laoise -> Newbridge   36   100   0.36    Newbridge -> Naas   9   100   0.09    Naas -> Celbridge   15   60   0.25    Celbridge -> Maynooth   6   100   0.06    Maynooth -> Leixlip   7   100   0.07    Leixlip -> Bray   30   100   0.30    Bray -> Greystones   8   100   0.08    Greystones -> Dublin   24   100   0.24	Ennis	->	Tralee	81	100	0.81	23
Cork       -> Clonmel       72       100       0.72         Clonmel       -> Waterford       41       100       0.41         Waterford       -> Wexford       45       100       0.45         Wexford       -> Kilkenny       63       100       0.63         Kilkenny       -> Carlow       30       100       0.30         Carlow       -> Port laoise       33       100       0.33         Port laoise       -> Newbridge       36       100       0.36         Newbridge       -> Naas       9       100       0.09         Naas       -> Celbridge       15       60       0.25         Celbridge       -> Maynooth       6       100       0.06         Maynooth       -> Leixlip       7       100       0.07         Leixlip       -> Bray       30       100       0.30         Bray       -> Greystones       8       100       0.08         Greystones       -> Dublin       24       100       0.24	Tralee	->	Limerick	85	100	0.85	76
Clonmel       -> Waterford       41   100   0.41           Waterford       -> Wexford       45   100   0.45           Wexford       -> Kilkenny       63   100   0.63           Kilkenny       -> Carlow       30   100   0.30           Carlow       -> Port laoise       33   100   0.33           Port laoise       -> Newbridge       36   100   0.36           Newbridge       -> Naas       9   100   0.09           Naas       -> Celbridge       15   60   0.25           Celbridge       -> Maynooth       6   100   0.06           Maynooth       -> Leixlip       7   100   0.07           Leixlip       -> Bray       30   100   0.30           Bray       -> Greystones       8   100   0.08           Greystones       -> Dublin       24   100   0.24	Limerick	->	Cork	86	100	0.86	247
Waterford       -> Wexford       45   100   0.45           Wexford       -> Kilkenny       63   100   0.63           Kilkenny       -> Carlow       30   100   0.30           Carlow       -> Port laoise       33   100   0.33           Port laoise       -> Newbridge       36   100   0.36           Newbridge       -> Naas       9   100   0.09           Naas       -> Celbridge       15   60   0.25           Celbridge       -> Maynooth       6   100   0.06           Maynooth       -> Leixlip       7   100   0.07           Leixlip       -> Bray       30   100   0.30           Bray       -> Greystones       8   100   0.08           Greystones       -> Dublin       24   100   0.24	Cork	->	Clonmel	72	100	0.72	11
Wexford       -> Kilkenny       63       100       0.63         Kilkenny       -> Carlow       30       100       0.30         Carlow       -> Port laoise       33       100       0.33         Port laoise       -> Newbridge       36       100       0.36         Newbridge       -> Naas       9       100       0.09         Naas       -> Celbridge       15       60       0.25         Celbridge       -> Maynooth       6       100       0.06         Maynooth       -> Leixlip       7       100       0.07         Leixlip       -> Bray       30       100       0.30         Bray       -> Greystones       8       100       0.08         Greystones       -> Dublin       24       100       0.24	Clonmel	->	Waterford	41	100	0.41	43
Kilkenny       -> Carlow       30   100   0.30           Carlow       -> Port laoise       33   100   0.33           Port laoise       -> Newbridge       36   100   0.36           Newbridge       -> Naas       9   100   0.09           Naas       -> Celbridge       15   60   0.25           Celbridge       -> Maynooth       6   100   0.06           Maynooth       -> Leixlip       7   100   0.07           Leixlip       -> Bray       30   100   0.30           Bray       -> Greystones       8   100   0.08           Greystones       -> Dublin       24   100   0.24	Waterford	->	Wexford	45	100	0.45	16
Carlow       -> Port laoise       33   100   0.33           Port laoise       -> Newbridge       36   100   0.36           Newbridge       -> Naas       9   100   0.09           Naas       -> Celbridge       15   60   0.25           Celbridge       -> Maynooth       6   100   0.06           Maynooth       -> Leixlip       7   100   0.07           Leixlip       -> Bray       30   100   0.30           Bray       -> Greystones       8   100   0.08           Greystones       -> Dublin       24   100   0.24	Wexford	->	Kilkenny	63	100	0.63	17
Port laoise       -> Newbridge       36   100   0.36           Newbridge       -> Naas       9   100   0.09           Naas       -> Celbridge       15   60   0.25           Celbridge       -> Maynooth       6   100   0.06           Maynooth       -> Leixlip       7   100   0.07           Leixlip       -> Bray       30   100   0.30           Bray       -> Greystones       8   100   0.08           Greystones       -> Dublin       24   100   0.24	Kilkenny	->	Carlow	30	100	0.30	10
Newbridge       -> Naas       9   100   0.09           Naas       -> Celbridge       15   60   0.25           Celbridge       -> Maynooth       6   100   0.06           Maynooth       -> Leixlip       7   100   0.07           Leixlip       -> Bray       30   100   0.30           Bray       -> Greystones       8   100   0.08           Greystones       -> Dublin       24   100   0.24	Carlow	->	Port laoise	33	100	0.33	5
Naas       -> Celbridge       15   60   0.25           Celbridge       -> Maynooth       6   100   0.06           Maynooth       -> Leixlip       7   100   0.07           Leixlip       -> Bray       30   100   0.30           Bray       -> Greystones       8   100   0.08           Greystones       -> Dublin       24   100   0.24	Port laoise	->	Newbridge	36	100		21
Celbridge       -> Maynooth       6   100   0.06           Maynooth       -> Leixlip       7   100   0.07           Leixlip       -> Bray       30   100   0.30           Bray       -> Greystones       8   100   0.08           Greystones       -> Dublin       24   100   0.24	Newbridge	->	Naas	9	100	0.09	25
Maynooth       -> Leixlip       7   100   0.07           Leixlip       -> Bray       30   100   0.30           Bray       -> Greystones       8   100   0.08           Greystones       -> Dublin       24   100   0.24	Naas	->	Celbridge	15	60	0.25	23
Leixlip       -> Bray       30   100   0.30           Bray       -> Greystones       8   100   0.08           Greystones       -> Dublin       24   100   0.24	Celbridge	->	Maynooth		100	0.06	12
Bray -> Greystones   8   100   0.08   Greystones -> Dublin   24   100   0.24	Maynooth	->	Leixlip	7	100	0.07	10
Greystones -> Dublin   24   100   0.24	Leixlip	->	Bray	30	100	0.30	33
	•	->	Greystones	8	100		11
Quantity Dolivored . 900	Greystones	->	Dublin	24	100	0.24	0
Distance Covered : 1331	Quantity Deliv		: 890				

Figure 10: Goods Delivery Optimal Cost : With Capacity Constraint - Run2

Dublin	-> Swords	13	100	0.13	23
Swords	-> Malahide	j 3 j	100	0.03	13
Malahide	-> Greystones	j 35 j	100 j	0.35	10
Greystones	-> Bray	8	100	0.08	46
Bray	-> Dublin	16	100	0.16	6
Quantity Deli	vered : 92				
Distance Cove	red : 75				
Number of Sto TRIP	ps in Trip: 5				
Dublin	-> Maynooth	23	100	0.23	13
Maynooth	-> Leixlip	7	100	0.07	12
eixlip	-> Celbridge	5	100	0.05	15
Celbridge	-> Naas	15	100	0.15	11
laas	-> Newbridge	9	100	0.09	17
Newbridge	-> Port laoise	36	100	0.36	8
Port laoise	-> Kilkenny	42	100	0.42	14
Kilkenny	-> Carlow	30	100	0.30	13
Carlow	-> Wexford	63	100	0.63	15
<i>l</i> exford	-> Waterford	45	100	0.45	54
<i>l</i> aterford	-> Clonmel	41	100	0.41	23
Clonmel	-> Cork	72	100	0.72	164
Cork	-> Tralee	95	100	0.95	26
Tralee	-> Limerick	85	100	0.85	75
_imerick	-> Ennis	32	100	0.32	24
Ennis	-> Killarney	41	60	0.68	16
Killarney	-> Galway	39	100	0.39	44
Balway	-> Athlone	75	100	0.75	27
thlone	-> Tullamore	34	100	0.34	16
Tullamore	-> Mullingar	29	100	0.29	18
lullingar	-> Sligo	112	100	1.12	12
Sligo	-> Letterkenny	87	100	0.87	12
etterkenny	-> Dundalk	133	100	1.33	56
Dundalk	-> Navan	43	100	0.43	22
lavan	-> Drogheda	22	100	0.22	36
rogheda	-> Swords	31	100	0.31	23
Swords	-> Malahide	3	100	0.03	13
Malahide	-> Greystones	35	100	0.35	16
Greystones	-> Bray	8	100	0.08	46
Bray	-> Dublin	16	100	0.16	6

Figure 11: Goods Delivery Optimal Cost : With Capacity Constraint - Run3

#### With Capacity Constraint and Time Constraint

Cost of Goods Deli From(City) - To (				Γime(Hours)	Quantity	
Dublin ->	Cork		218	100	2.18	104
Cork ->	Dublin		218	100	2.18	0
Quantity Delivered	: 104					
Distance Covered						
Number of Stops ir TRIP	Trip: 2					
Dublin ->	· Limerick		175	100	1.75	113
Limerick ->	Dublin		175	100	1.75	0
Quantity Delivered	: 113					
Distance Covered						
Number of Stops ir TRIP	Trip: 2					
Dublin ->	Galway	1	187	100	1.87	59
Galway ->	Dublin	1	187	100	1.87	0
Quantity Delivered						
Distance Covered	: 374					
Number of Stops ir TRIP	Trip: 2					
Dublin ->	Waterford		133	100	1.33	30
Waterford ->	Dublin		133	100	1.33	0
Quantity Delivered						
Distance Covered						
Number of Stops ir TRIP	Trip: 2					
Dublin ->	Dundalk		77	100	0.77	30
Dundalk ->	Dublin	ĺ	77	100	0.77	0
Quantity Delivered						
Distance Covered	: 154					

Figure 12: Goods Delivery Optimal Cost : With Capacity Constraint and Time Constraint