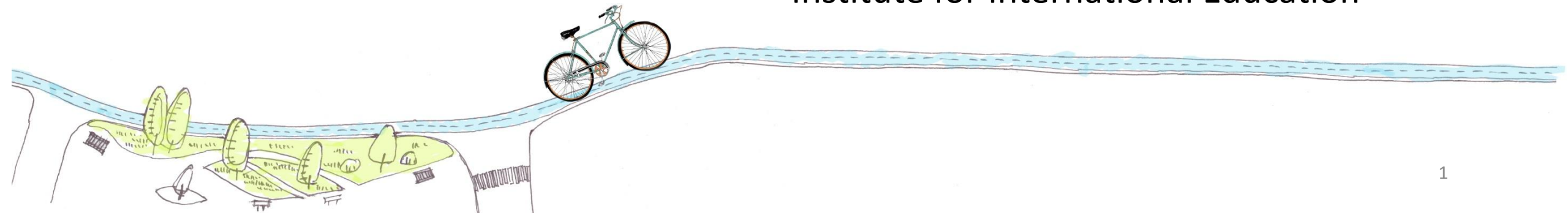# Revealed Preferences Route Choice Model for Cyclists in Kharkiv, Ukraine

Olena Chernyshova
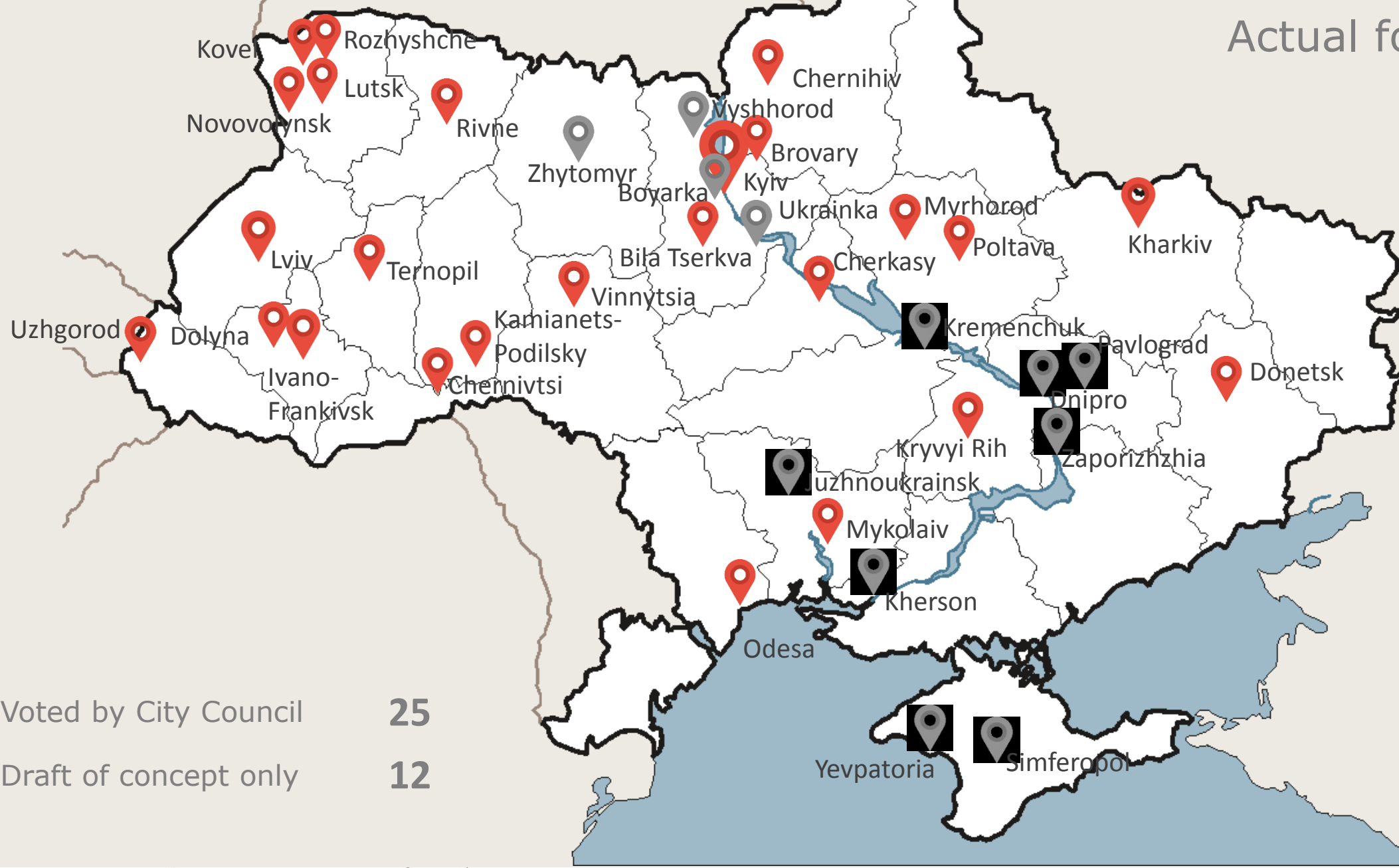
Kharkiv National Automobile and Highway University, Ukraine

City cycling concepts
Actual for 2017

Kovel
Rozhyshche
Lutsk
Novovolynsk
Rivne
Chernihiv
Myshhorod
Zhytomyr
Brovary
Boyarka
Kyiv
Ukrainka
Myrhorod
Poltava
Kharkiv
Lviv
Ternopil
Biła Tserkva
Cherkasy
Vinnytsia
Kremenchuk
Pavlograd
Uzhgorod
Dolyna
Kamianets-Podilsky
Dnipro
Donetsk
Ivano-Frankivsk
Chernivtsi
Kryvyi Rih
Zaporizhzhia
Yuzhnoukrainsk
Mykolaiv
Kherson
Odesa
Yevpatoria
Simferopol

Voted by City Council   25

Draft of concept only   12

Kyiv
Cyclists'
Association

Kharkiv, Ukraine

- 1.48 mil residents
- Over 10 K people participate in cycling day
- Long-standing culture of cycling sport
- Strong cycling community
- Political support for cycling strategy development
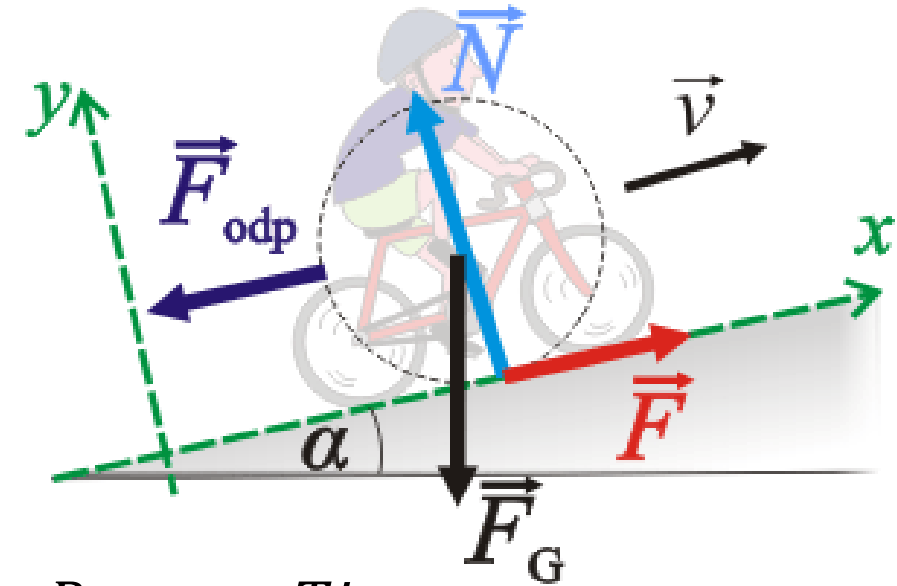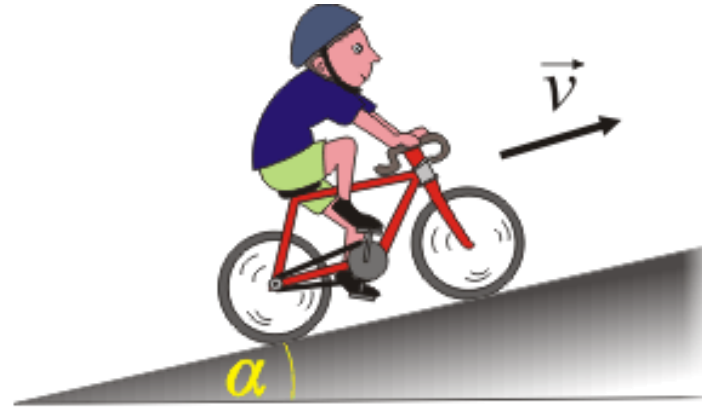
Challenges for modeling/cycling in Kharkiv

- Very Little traffic data available
- Small share of cyclists among road users (< 1%)
- Small share of women among cyclists
- City center on a hill with steep slopes
- Socio-demographic and employment data on a city district level only
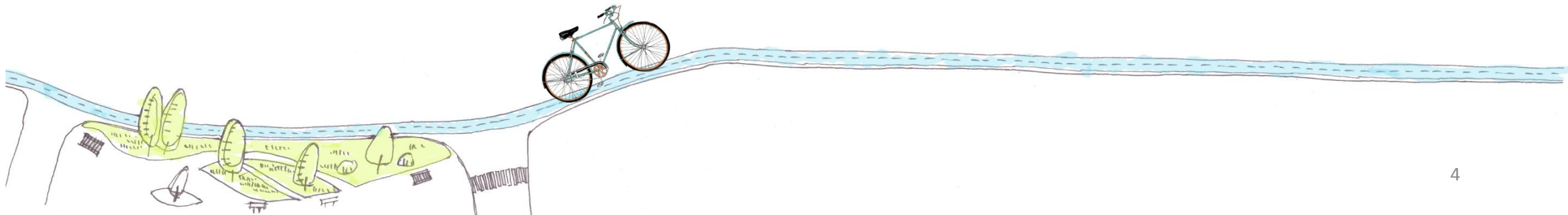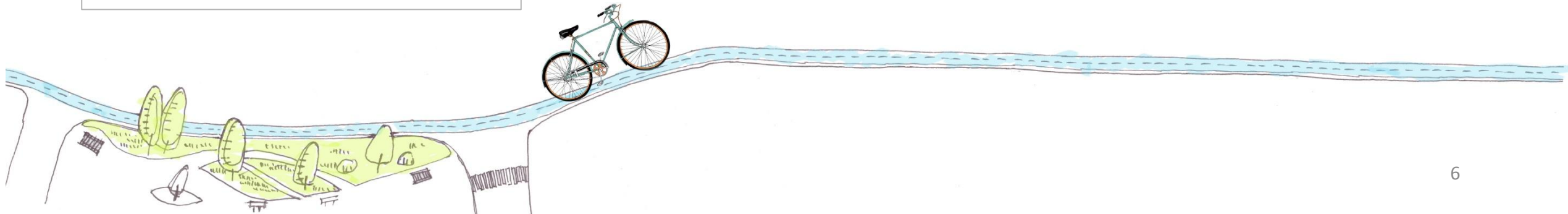
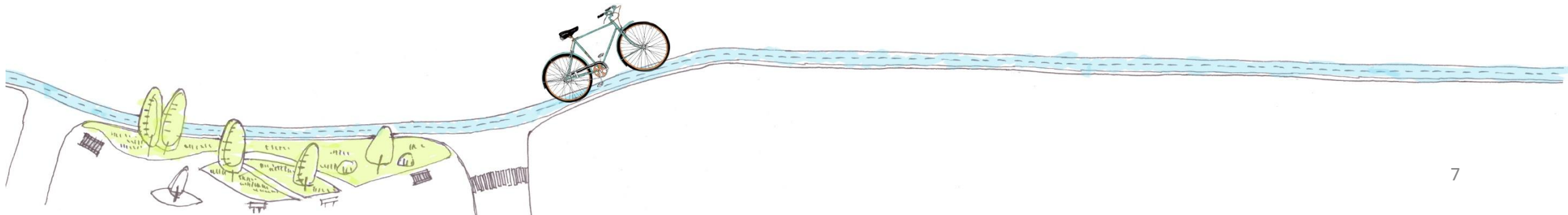# User preference survey

Slope vs Work

Physical Work = Power x Time

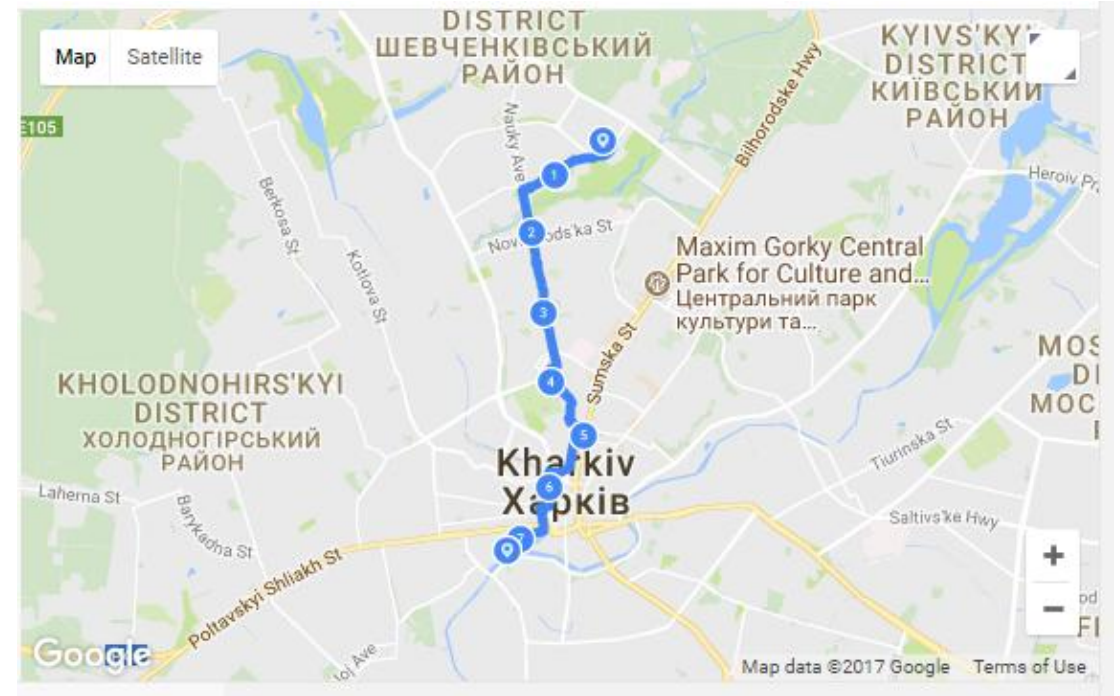$$Cycling\ Power = [K_A V^2 + mg(s + C_R)] \cdot V$$
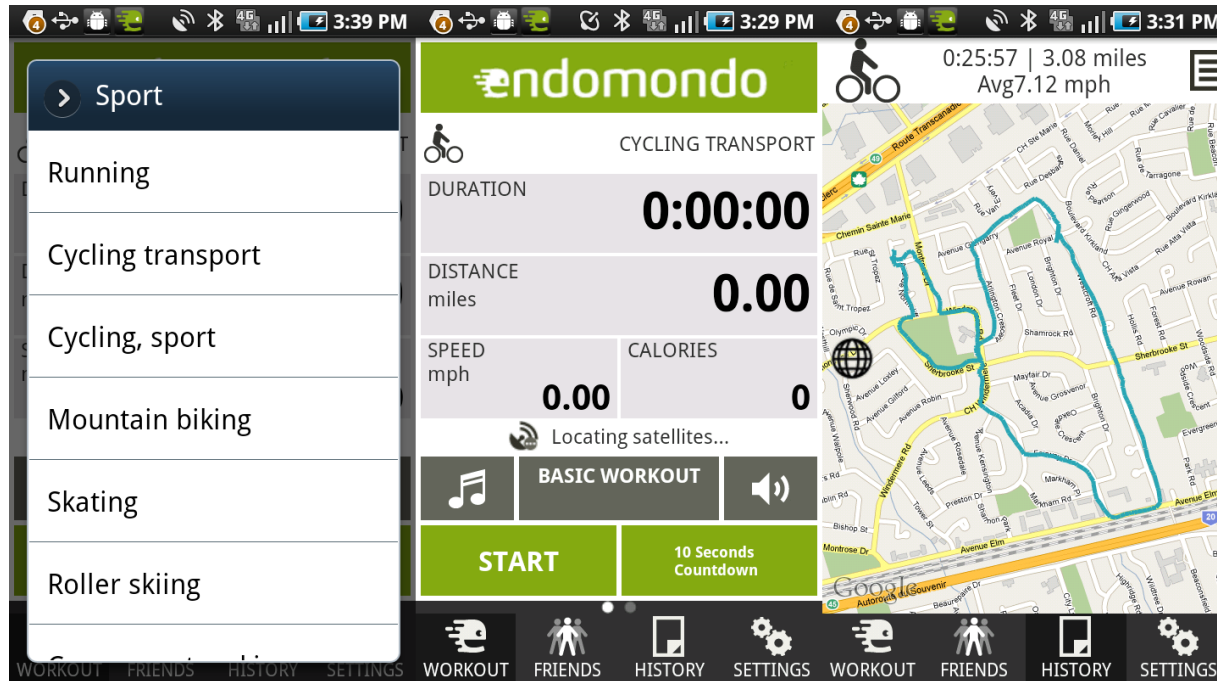
Assumptions and Parameters

- Safety
  - Speed of motorized traffic
  - Number of left turns and turns
  - Parking density

- Easiness of the route
  - Length
  - Physical work required to cycle
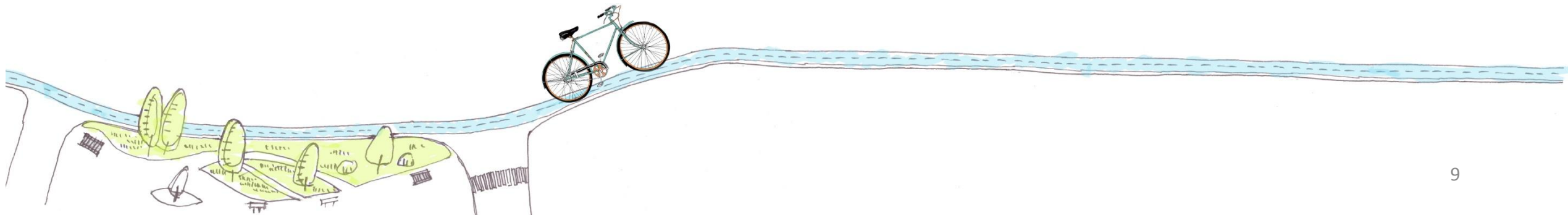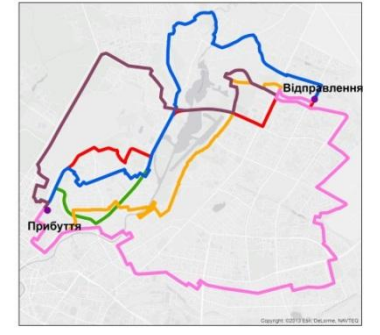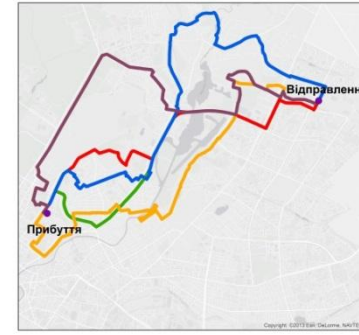
- Comfort
  - Number of traffic lights

Data collection

Methods applied

- MNL model with 6 parameters
- Choice set generation (link penalty)
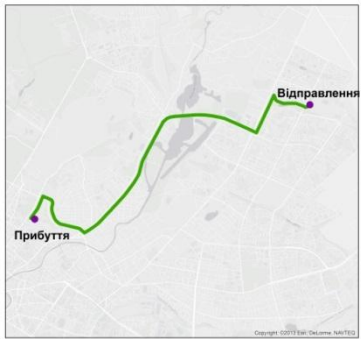
Descriptive statistics

Feature	Selected			Not-selected		
	Mean	Median	St. err.	Mean	Median	St. err.
Length, km	9.447	9.495	3.613	16.359	13.298	12.147
Parking density, unit	1.43	1.33	0.41	1.232	1.107	0.267
Speed of motorized vehicles. km/h	34.29	35.44	4.66	36.375	37.842	2.470
Number of turns, units	14.29	10.00	11.13	24.257	23	15.82
Physical work, kJ	280.13	264.07	125.60	399.98	343.860	260.854
Category of street	6.52	6.40	3.38	3.279	2.817	1.612

Preliminary findings

- Number of left turns and all turns are both significant factors
- More traffic lights seem to encourage selection of the route
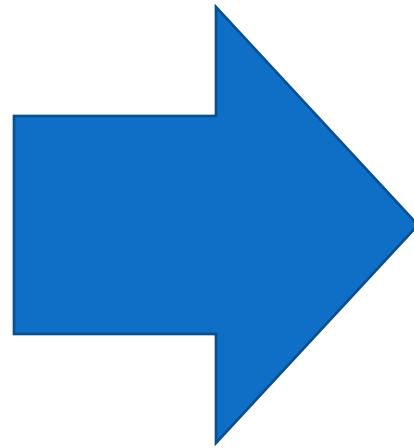
- Total number of turns can be used as a parameter
- Cyclist might select the major roads of the city, which tend to have more traffic light
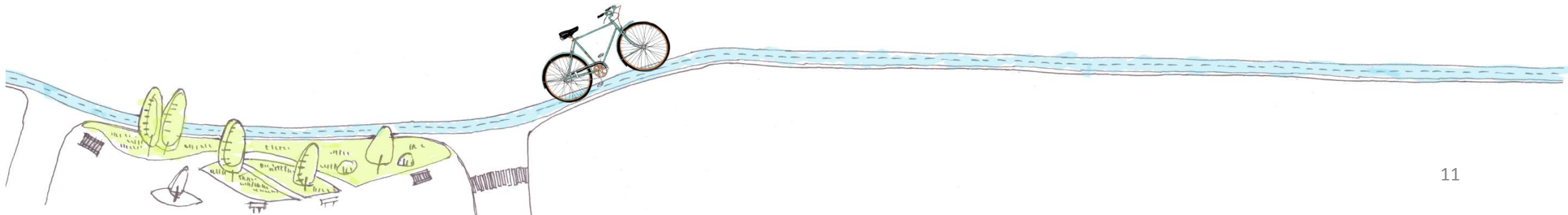
Modeling results

Attribute	"Length-Turn-Main Street Model"				"Work-Turn-Main Street Model"				"four parameter model"			
Number of parameters	3				3				4			
Final log-likelihood	-21.809				-41.284				-21.673			
χ^2	0.748				0.551				0.739			
	Coef.	Std err	t-test	p-value	Coef.	Std err	t-test	p-value	Coef.	Std err	t-test	p-value
Length	-2.51	0.742	-3.38	0.00	-	-	-	-	-2.53	0.734	-3.45	0.00
Parking	-	-	-	-	-	-	-	-	-	-	-	-
Speed	-	-	-	-	-	-	-	-	-	-	-	-
Turn	0.351	0.111	3.15	0.00	0.0722	0.0365	1.98	0.05	0.333	0.112	2.98	0.00
Work	-	-	-	-	-0.0186	0.0053	-3.51	0.00	0.00684	0.0135	0.51	0.61
Main Street	1.44	0.441	3.26	0.00	1.02	0.203	5.03	0.00	1.36	0.433	3.14	0.00

Conclusions and further research

- Cyclists prefer shortest routes with less physical effort
- Cyclists select main streets of the city (which have more traffic lights) rather minor roads
- Parking density and speed of motorized traffic is insignificant
- Using physical work parameter gives better modelling abilities than slope
- The results can be Integrated into assignment procedure of traffic model