

Turbo-Roundabout

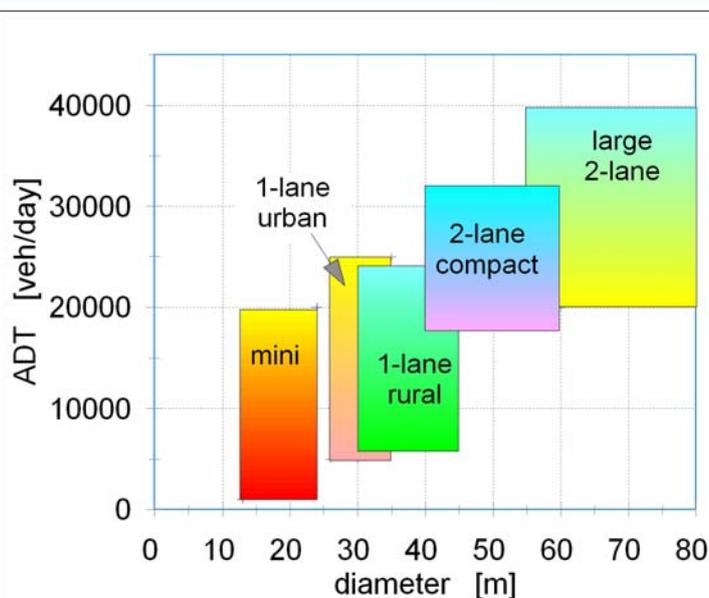
- an Experience from Germany

Werner Brilon
Ruhr-Universität Bochum, Germany

*Institute for Transportation
and Traffic Engineering*



Typology of roundabouts



Types according to

• ADT ↑

• size →



Starting Point

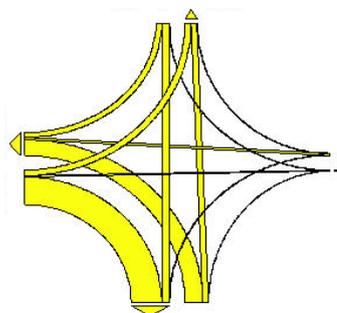
- Germany: Restrictive view on larger roundabouts (larger than single-lane)
- Large total capacities require balanced distribution of traffic volumes over the approaches and exits
- What to do, if traffic is concentrated on specific movements?



Starting Point

- What to do if traffic is concentrated on specific movements?

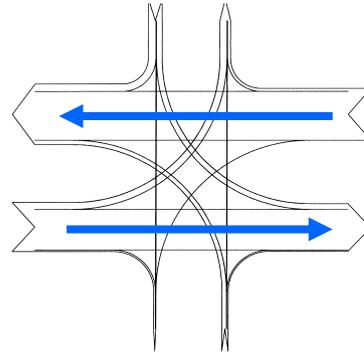
large right turn movements : Bypass



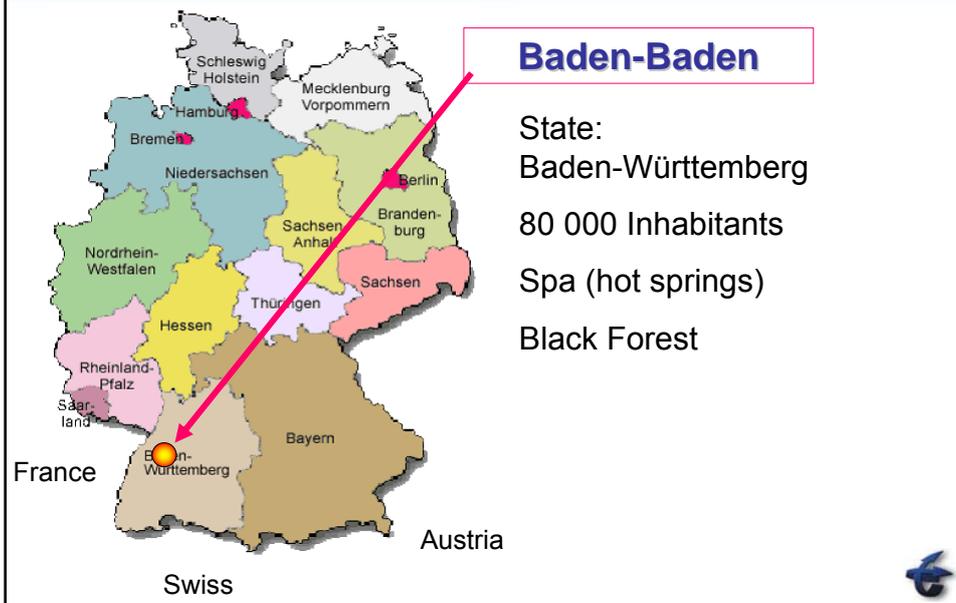
Starting Point

- What to do if traffic is concentrated on specific movements?

large through movements :



Roundabout in Baden-Baden



Starting Point : local situation in Baden-Baden

to city of Baden-Baden ⇒

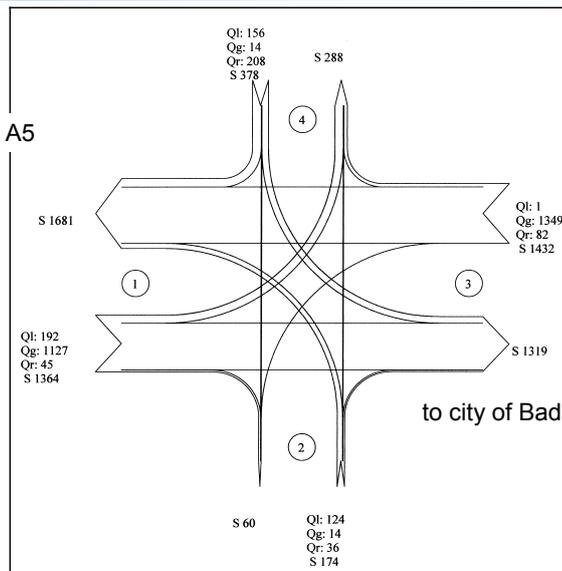


to motorway A5



Starting Point : traffic volumes

← to motorway A5

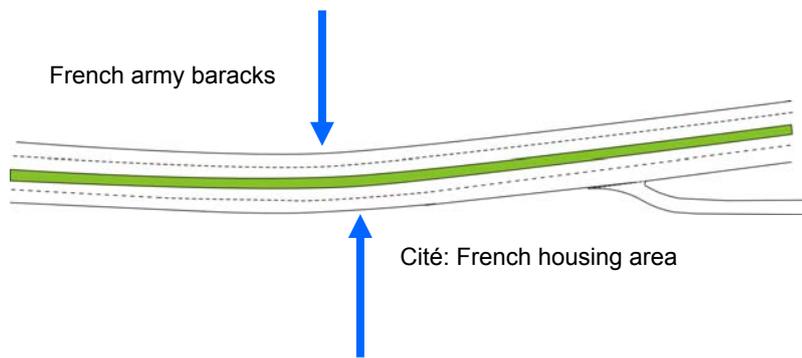


to city of Baden-Baden ⇒

ADT:
31000 veh/d



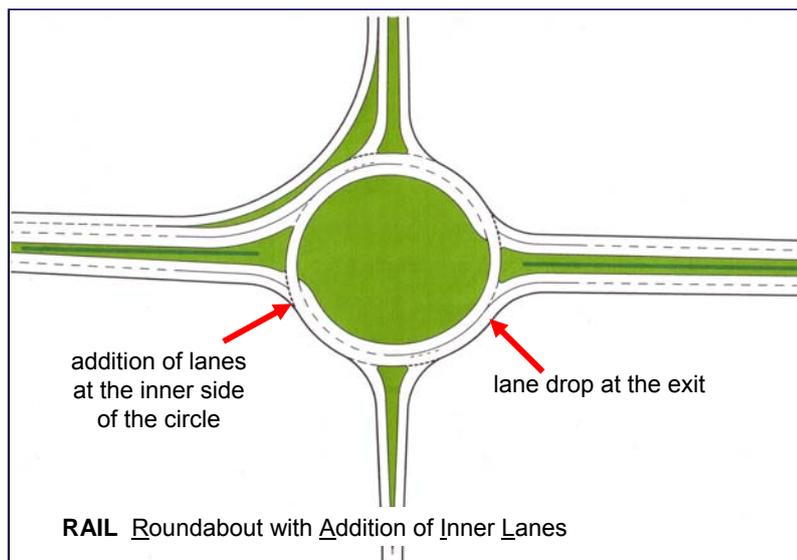
Problem : new interchange



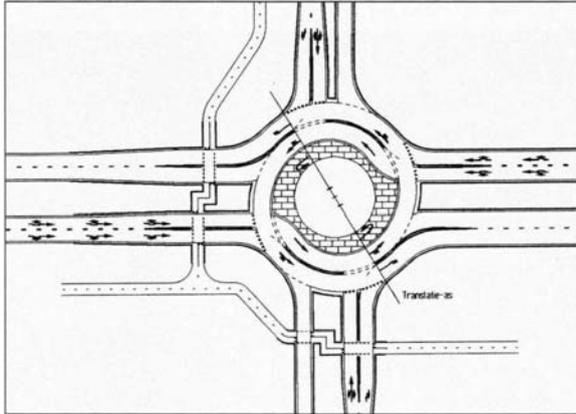
**Architects: best solution:
Roundabout**



Solution : Turbo-roundabout



Turbo-roundabout : Netherlands



invented by
Bertus Fortuijn

source: homepage of Bertus Fortuijn



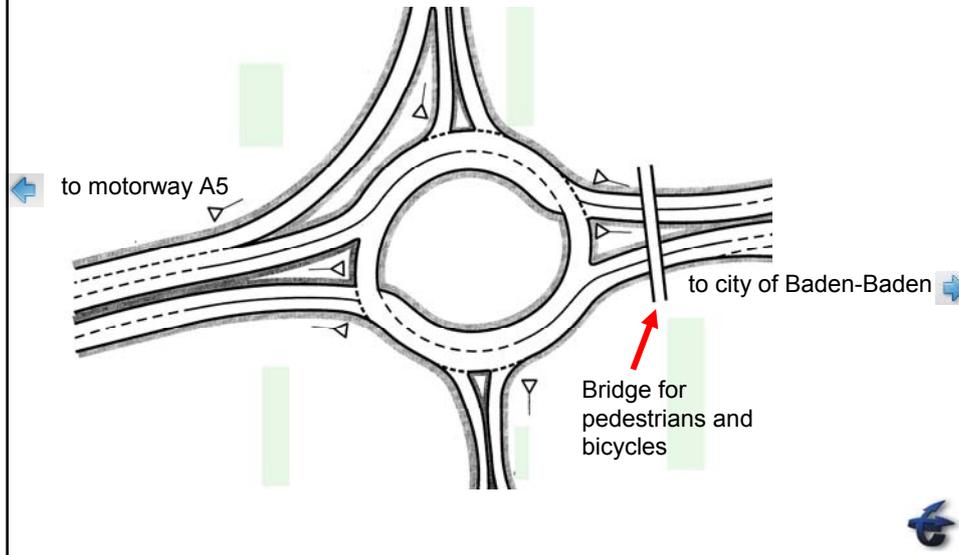
Turbo-roundabout : Netherlands



kerbs as dividers
between lanes



Turbo-roundabout Baden-Baden



Turbo-roundabout Baden-Baden



Turbo-Roundabout

Baden-Baden



- no kerbs within the circle
- no pedestrians or cyclists (are on a bridge)



Turbo-Roundabout

Baden-Baden



- no kerbs within the circle
- no pedestrians or cyclists (are on a bridge)



Turbo-Roundabout Baden-Baden



- no kerbs within the circle
- no pedestrians or cyclists (are on a bridge)



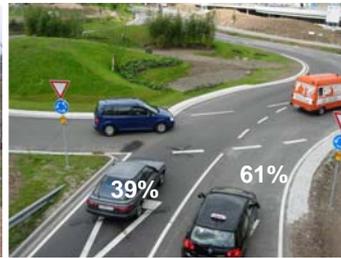
Turbo-Roundabout Baden-Baden



Utilisation of lanes

	B 500 from West to East (coming from freeway A 5 heading to city centre) →		B 500 from East to West (from city centre heading to freeway A 5) ←	
	left lane	right lane	left lane	right lane
Entry	24 %	76 %	39 %	61 %
Exit	23 %	77 %	40 %	60 %

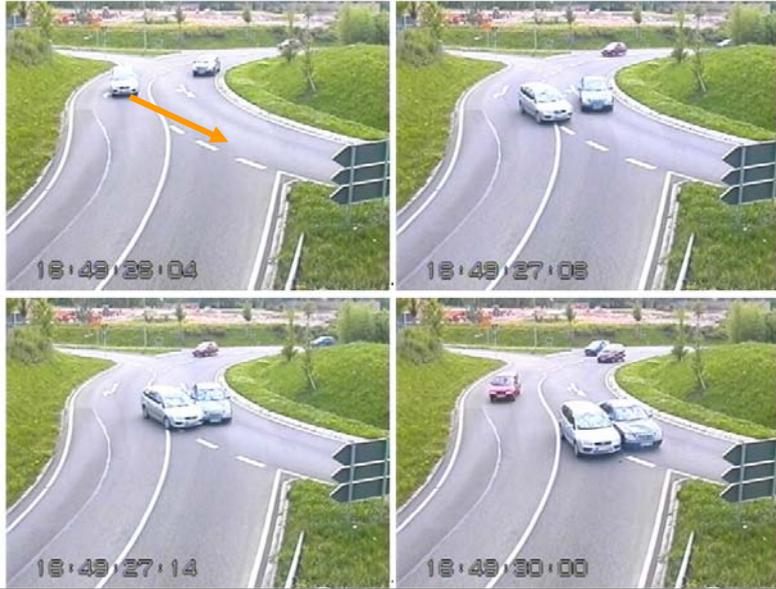
24%
76%



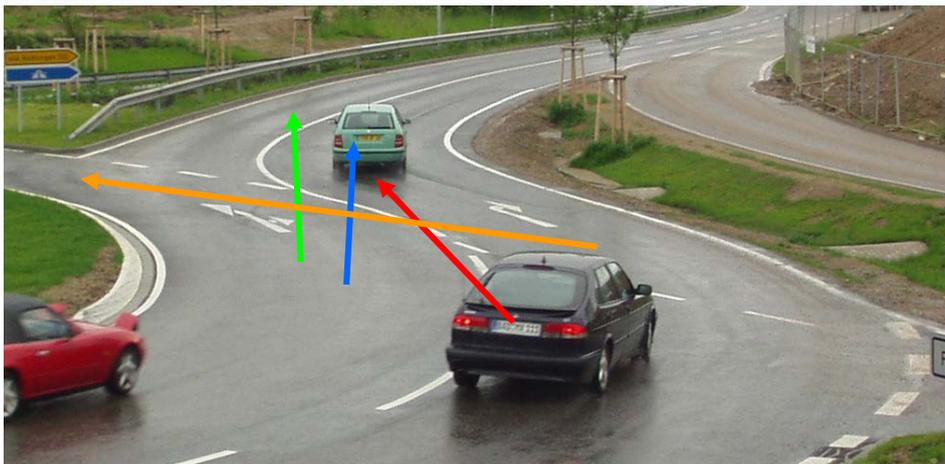
Illegal crossing of lane markings



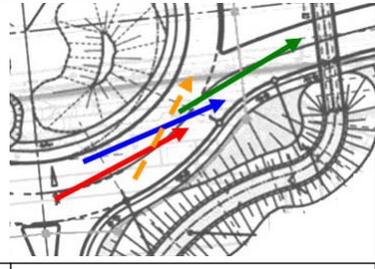
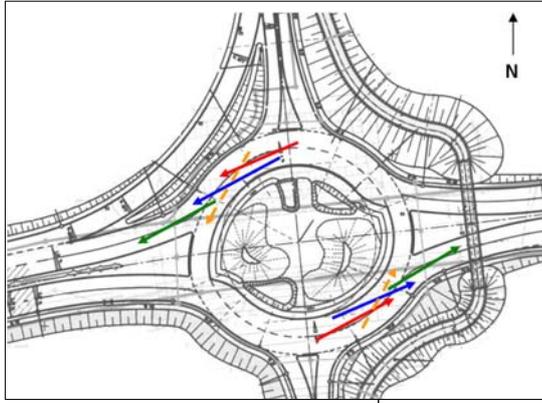
Illegal crossing of lane markings



Illegal crossing of lane markings

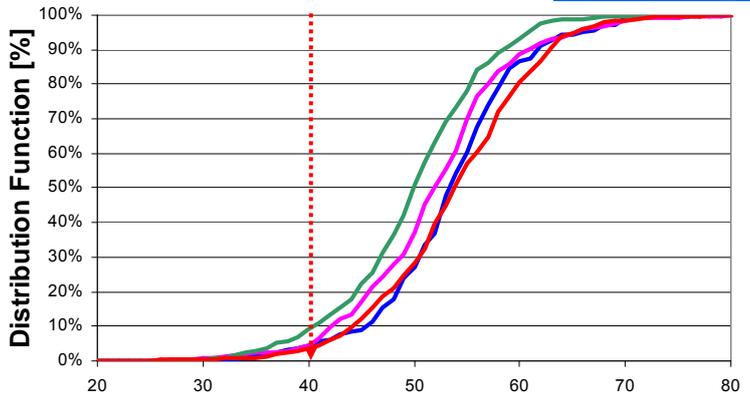


Illegal crossing of lane markings



	violators [%]	
	Eastbound traffic	Westbound traffic
red →	8 - 12	6 - 18
green →	1 - 7	1 - 20
blue →	1 - 5	3
yellow →	0 - 3	0

Speeds on the western approach



— June 2006 (Morning)	— June 2006 (Afternoon)
— Jan. 2007 (Morning - Rain)	— Jan. 2007 (Afternoon)

Critical gaps and follow-up times

	critical gap t_c		follow-up time t_f	
	absolute [s]	sample size [veh]	absolute [s]	sample size [veh]
two-lane entry	4.5	62	2.4	4667
single-lane entry	4.7	180	2.8	23



Calculation of capacity and quality of service

Capacity, average delay, and queue length - only motorized traffic

Turbo-Kreisverkehr an der B 600
Turbo-Beispiel KREISSEL
B 600 / Grünweg
Nachmittagsspitzenstunde

File: Turbo_16500.kre

Capacity, average delay, and queue length - only motorized traffic:

Name	Type of	q-e-l pcu/h	q-e-r pcu/h	q-c-l pcu/h	q-c-r pcu/h	q-e-dema. pcu/h	q-e-max pcu/h	x	Reserve pcu/h	av. dly s	L pcu	L-95 pcu	L-99 pcu	LDS
1 B 600 West (Richtung BAB)		657	986	0	359	1643	2040	0,81	397	9	2,8	12	18	A
2 Grünweg		177	43	666	1090	220	308	0,71	88	39	1,7	7	9	D
3 B600 Ost (Richtung City)		632	948	0	494	1500	1795	0,88	219	15	4,8	18	27	B
4 Gewerbehing		178	0	640	1016	178	314	0,57	136	26	0,9	4	6	C
4 Bypass		-	-	-	-	784	1400	0,56	616	6	-	-	-	A

Result:
Overall performance level: **D**

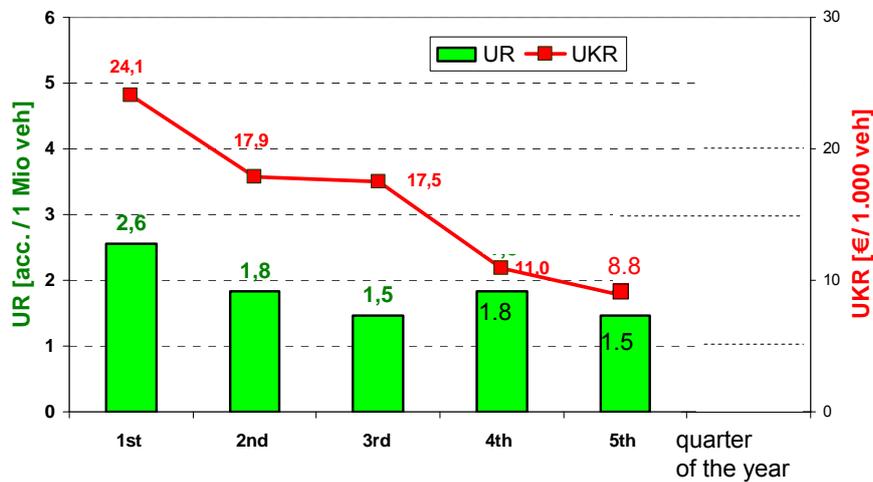
Calculation settings
Delay: Kimber, Hollis (1979) with $F_{th} = 0.9 / T = 3600$
Capacity: Germany: Turbo-Roundabout
Queue-length: Wu, 1997

Definition: Geometry of the Turbo Roundabout
Entry: B 600 West (Richtung BAB)

Exit: 1, 2, 3, 4, 5, 6
Entry: 1, 2, 3, 4, 5, 6

www.R-about.de

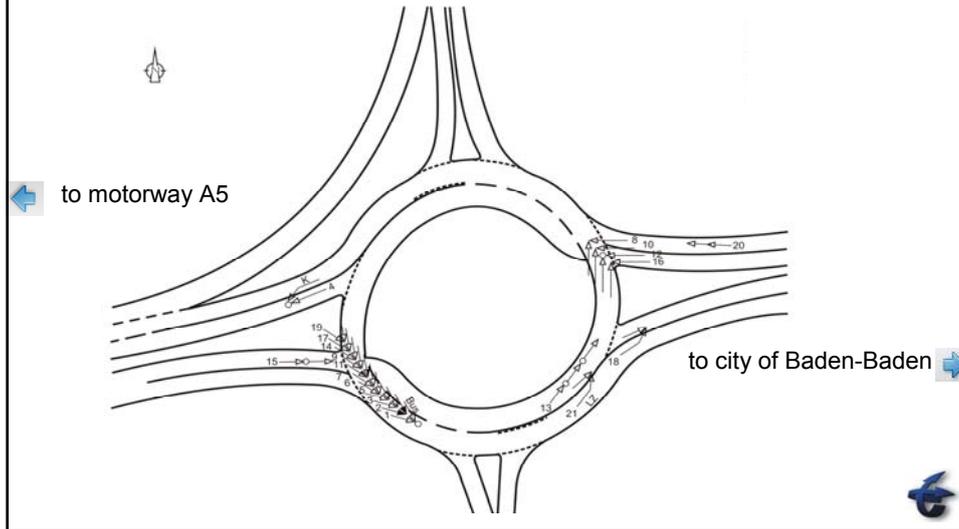
Accident rates (UR) + accident cost rates (UKR)



Accident rates (UR) + accident cost rates (UKR)

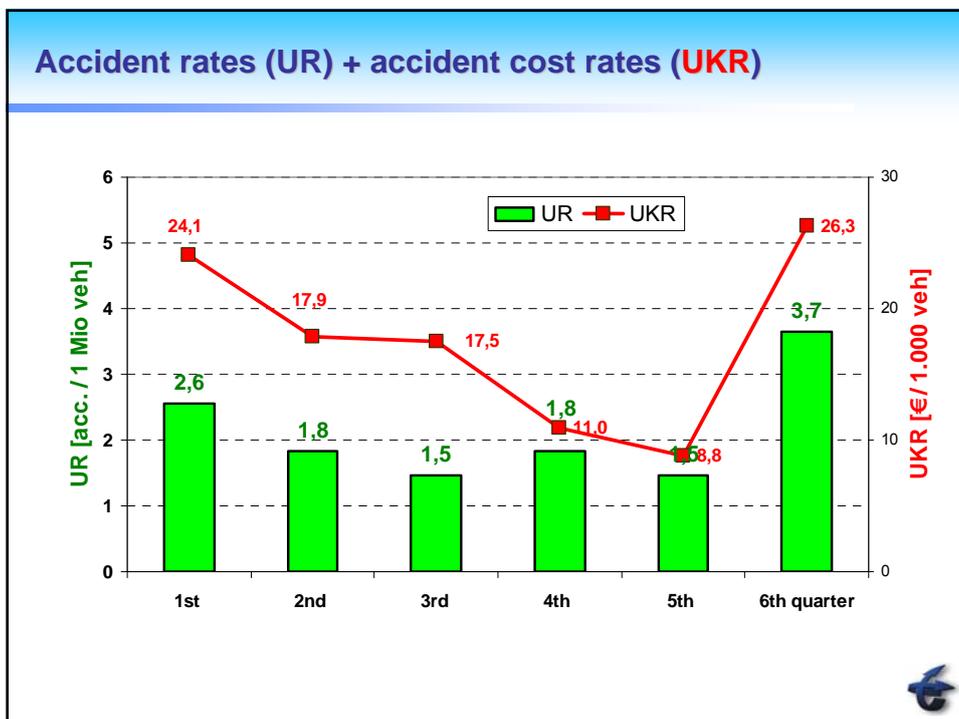
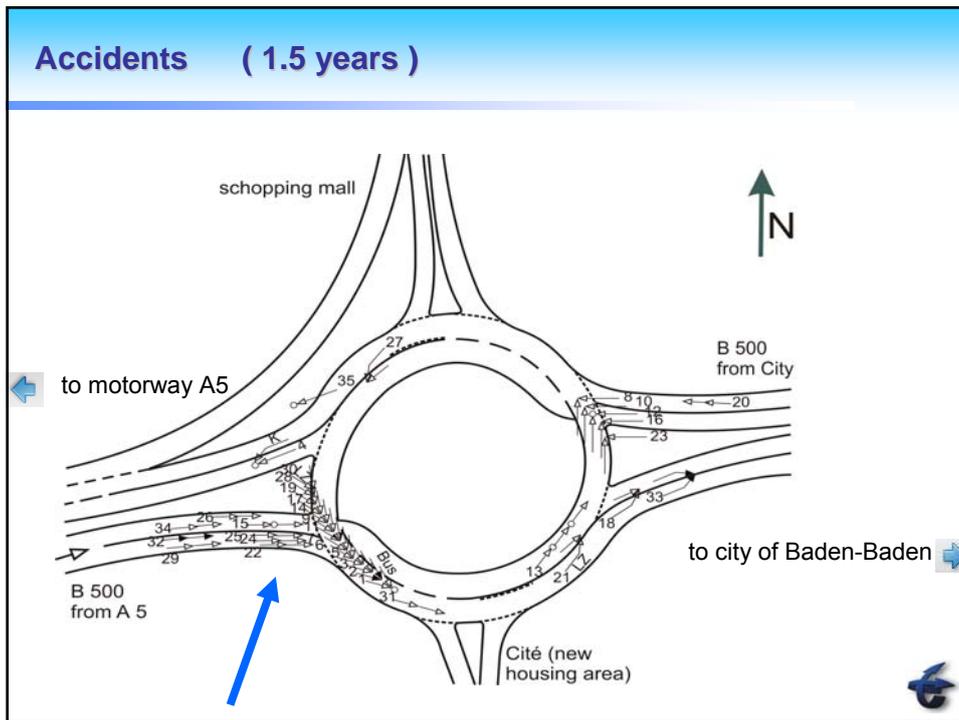
	UR [acc. / 10 ⁶ veh]	UKR [EURO / 1.000 veh]
Turbo-R. Baden-Baden	1,9	17,60
Roundabout with presceening + lane marking (urban)	0,63 – 1,46	6,58 – 13,92
Roundabout with presceening + lane marking (rural)	3,29 – 4,43	17,08 – 36,26
Signalized intersection (3 stages)	1,2	39

Accidents (1st year)



Safety improvement : Increasing the sight distance





Accident rates (UR) + accident cost rates (UKR)

	UR [acc. / 10 ⁶ veh]	UKR [EURO / 1.000 veh]
Turbo-R. Baden-Baden	2.1	17,60
Roundabout with presceening + lane marking (urban)	0,63 – 1,46	6,58 – 13,92
Roundabout with presceening + lane marking (rural)	3,29 – 4,43	17,08 – 36,26
Signalized intersection (3 stages)	1,2	39



Conclusions

- Turbo-roundabout works
- is capable to treat large volumes of through-traffic
under lower demand on the side approaches
- no cyclists should be allowed
- pedestrians ? (better not)
- no severe accidents
- safety needs carefull consideration
(damage-only accidents)
- problem: too low crossing volumes
- just one case! more experience needed
- **However: Enthusiastic planning activities !**



Thank you for your attention

