

# Turbo-Roundabout

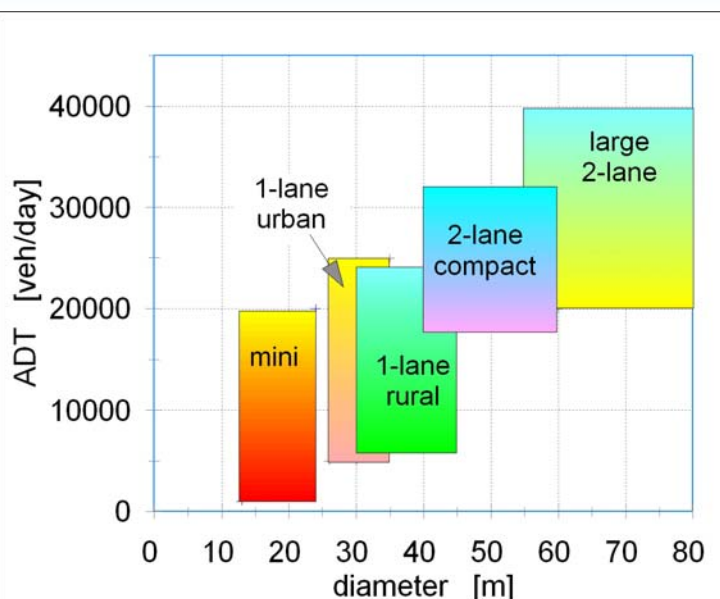
## - an Experience from Germany

**Werner Brilon**  
*Ruhr-Universität Bochum, Germany*

*Institute for Transportation  
and Traffic Engineering*



### Typology of roundabouts



Types  
according  
to

• ADT ↑

• size →



## Starting Point

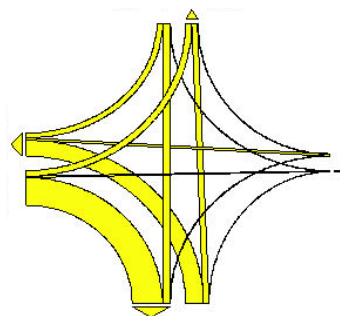
- Germany: Restrictive view on larger roundabouts (larger than single-lane)
- Large total capacities require balanced distribution of traffic volumes over the approaches and exits
- What to do, if traffic is concentrated on specific movements?



## Starting Point

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

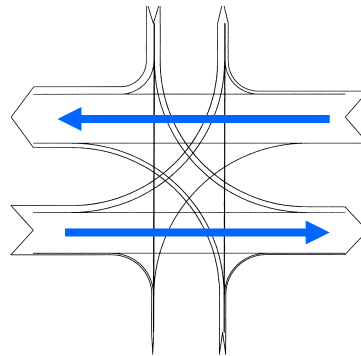
large right turn movements : Bypass



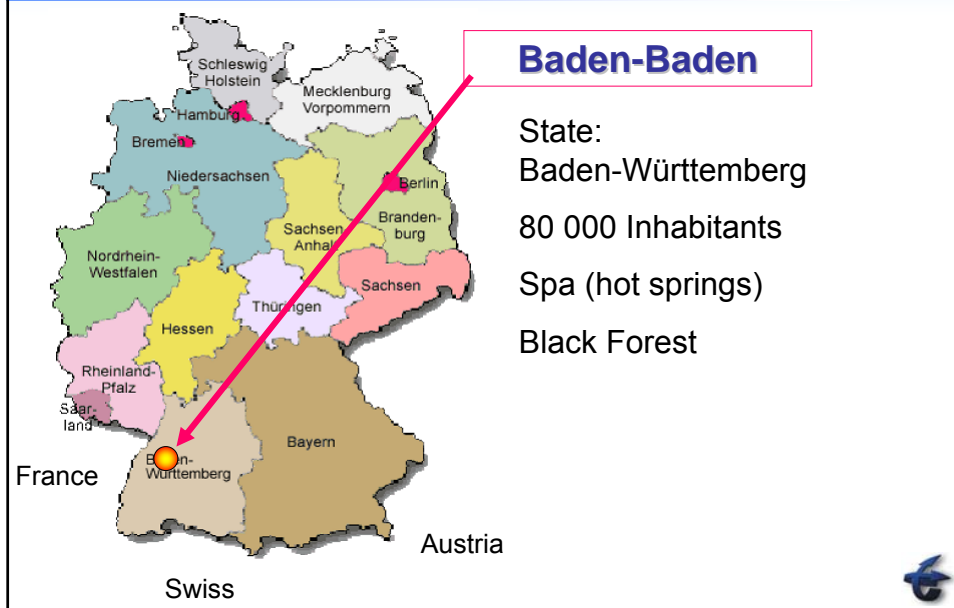
## Starting Point

- 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 ⇒

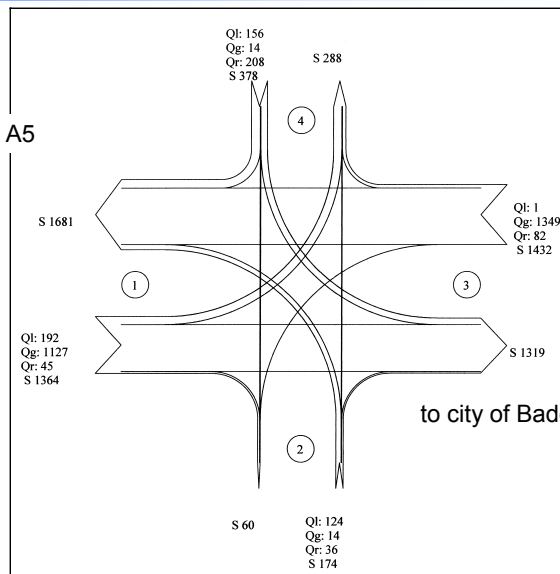


to motorway A5



## Starting Point : traffic volumes

← to motorway A5

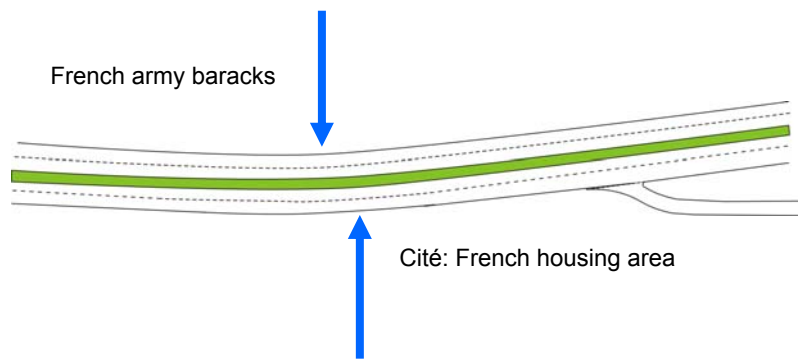


to city of Baden-Baden ⇒

**ADT:**  
**31000 veh/d**



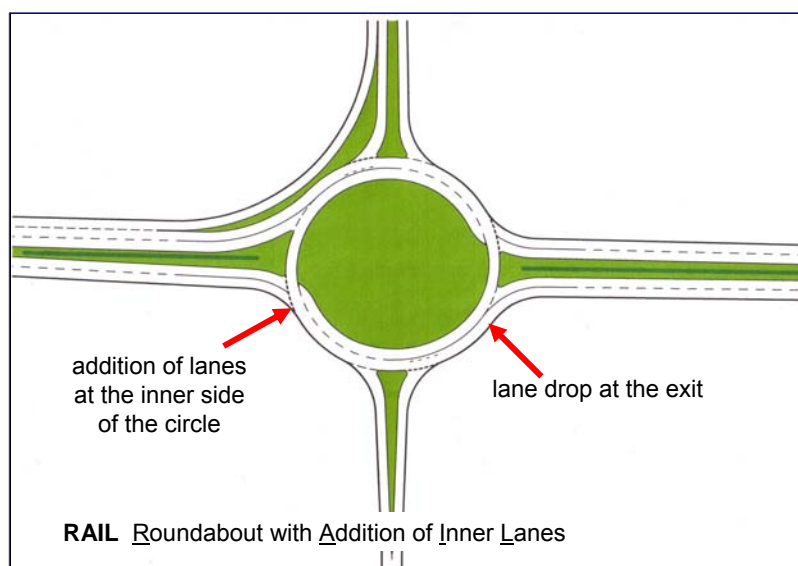
## Problem : new interchange



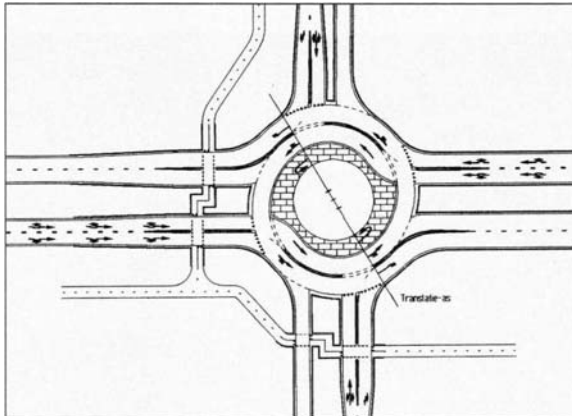
**Architects: best solution:  
Roundabout**



## Solution : Turbo-roundabout



## Turbo-roundabout : Netherlands



invented by  
Bertus Fortuijn

source: homepage of Bertus Fortuijn



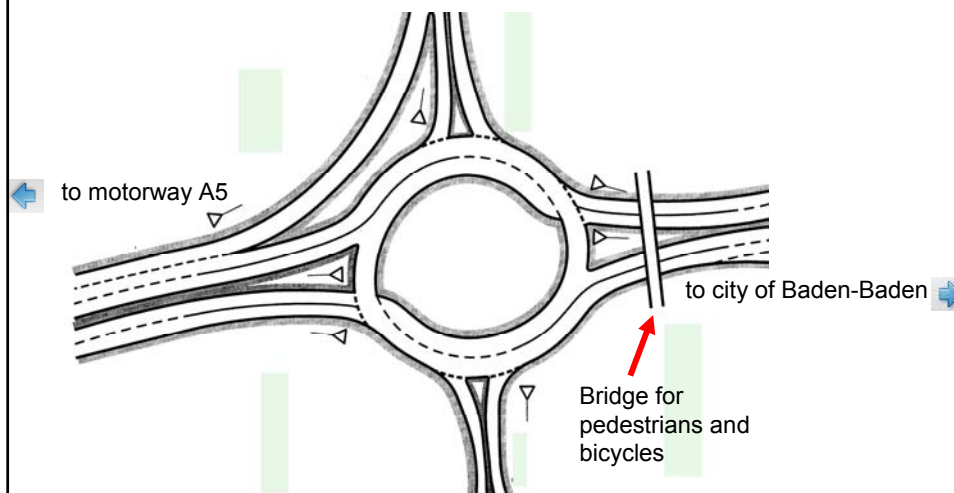
## Turbo-roundabout : Netherlands



kerbs as dividers  
between lanes



## Turbo-roundabout Baden-Baden



## Turbo-roundabout Baden-Baden



Baden-Baden  
opened May 2006  
≈ 30 000 veh/d



## 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 %

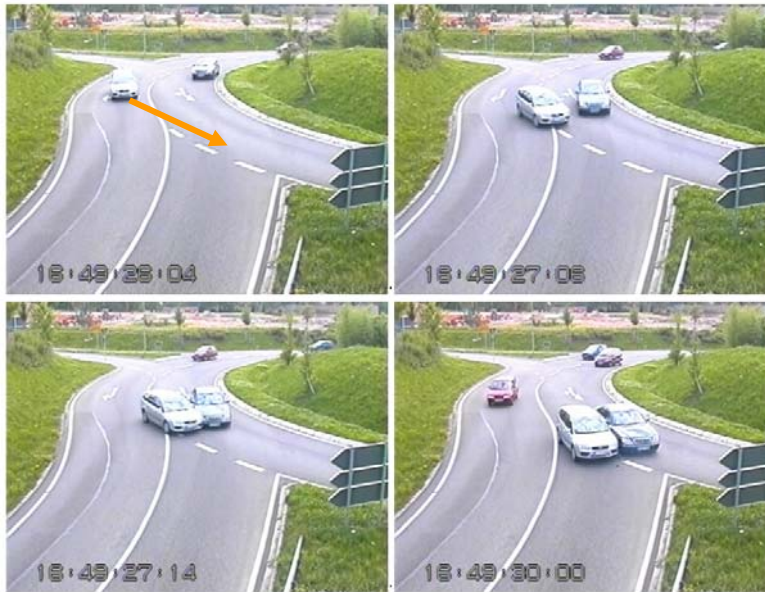
24%  
76%



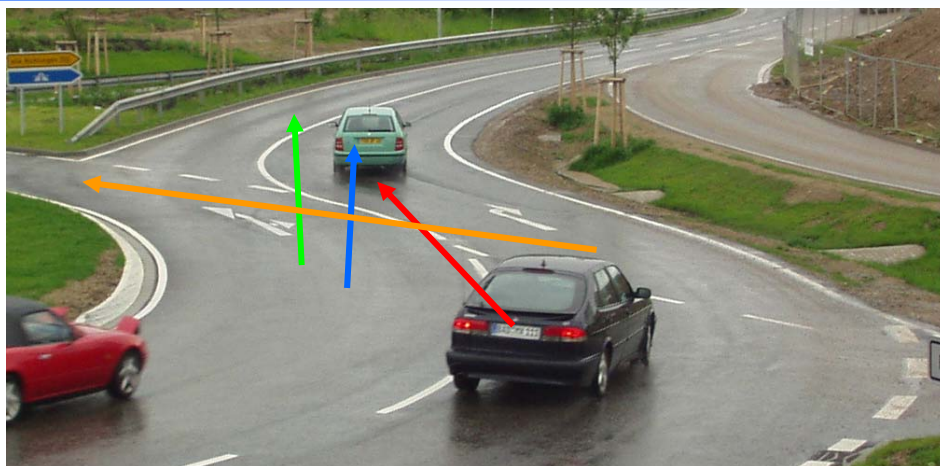
## Illegal crossing of lane markings



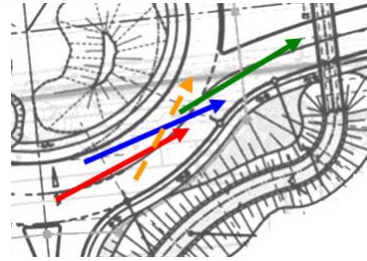
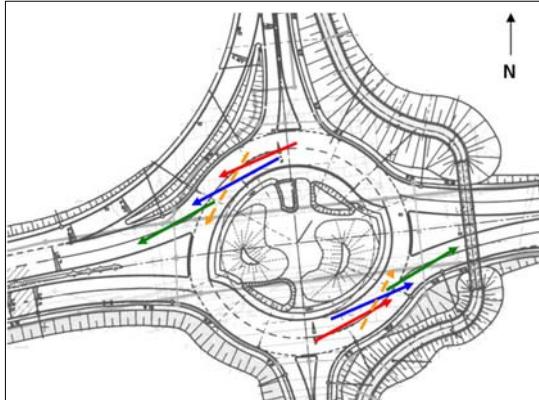
## Illegal crossing of lane markings



## Illegal crossing of lane markings

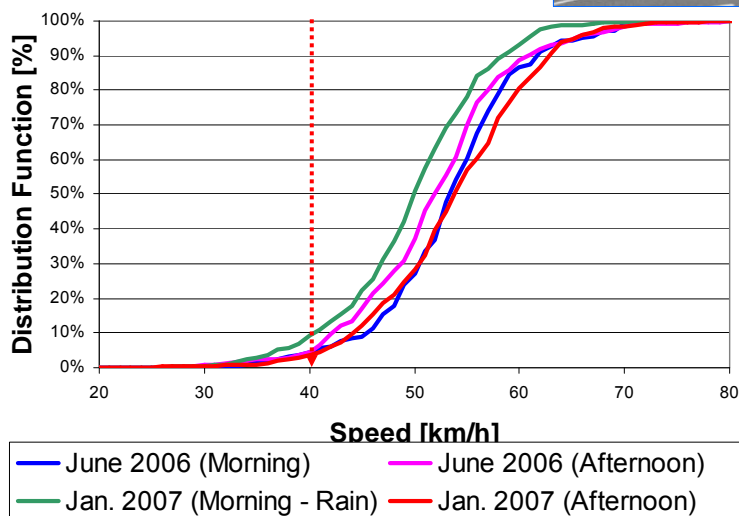


## Illegal crossing of lane markings



	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





## 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	<b>4.5</b>	62	<b>2.4</b>	4667
single-lane entry	<b>4.7</b>	180	<b>2.8</b>	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\_6000.krs

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	LOS
1 B 600 West (Richtung BAB)		657	906	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 B 600 Ost (Richtung City)		632	948	0	494	1500	1799	0,88	219	15	4,8	18	27	B
4 Gewerbezone		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**

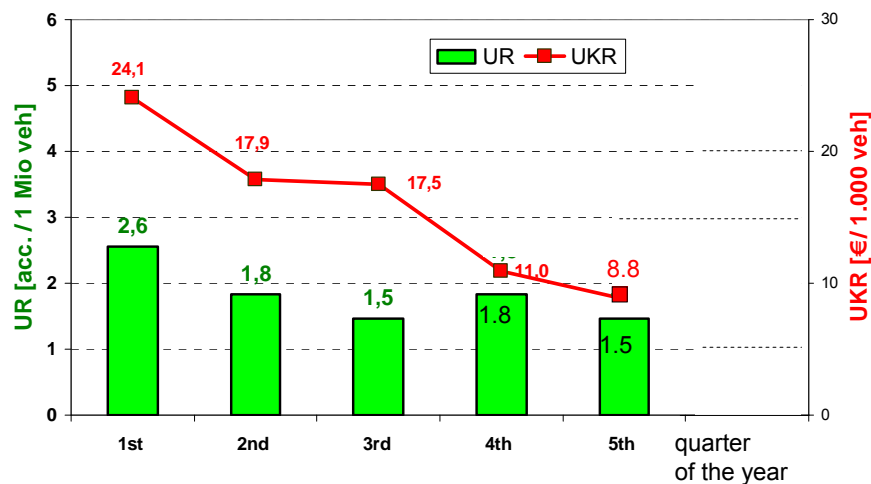
Calculation settings  
Delay: Kimber, Hollis (1979) with F-h - 0.0 / T = 3600  
Capacity Germany: Turbo-Roundabout  
Queue length Wu, 1997

Definition: Geometry of the Turbo Roundabout  
Entry: 1 B 600 West (Richtung BAB)

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

[www.R-about.de](http://www.R-about.de)

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

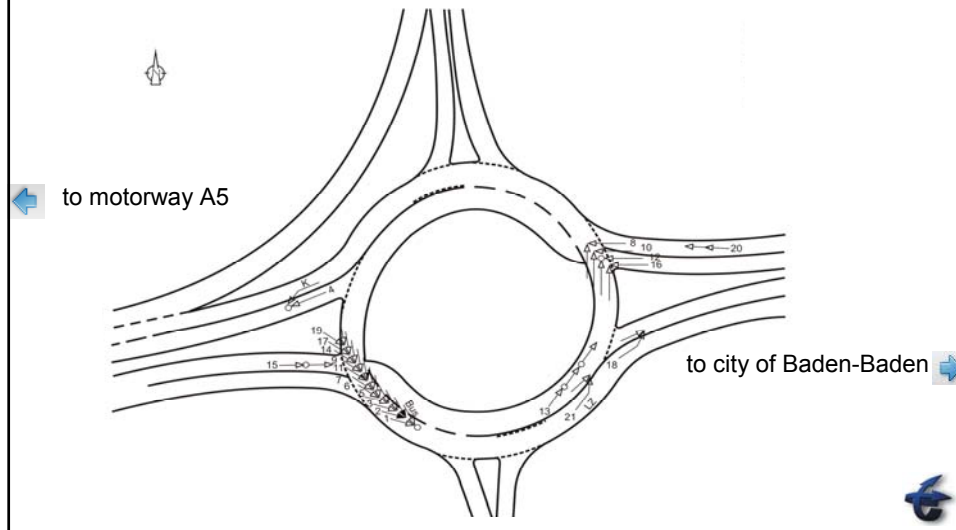


### Accident rates (UR) + accident cost rates (UKR)

	UR [acc. / 10 <sup>6</sup> 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

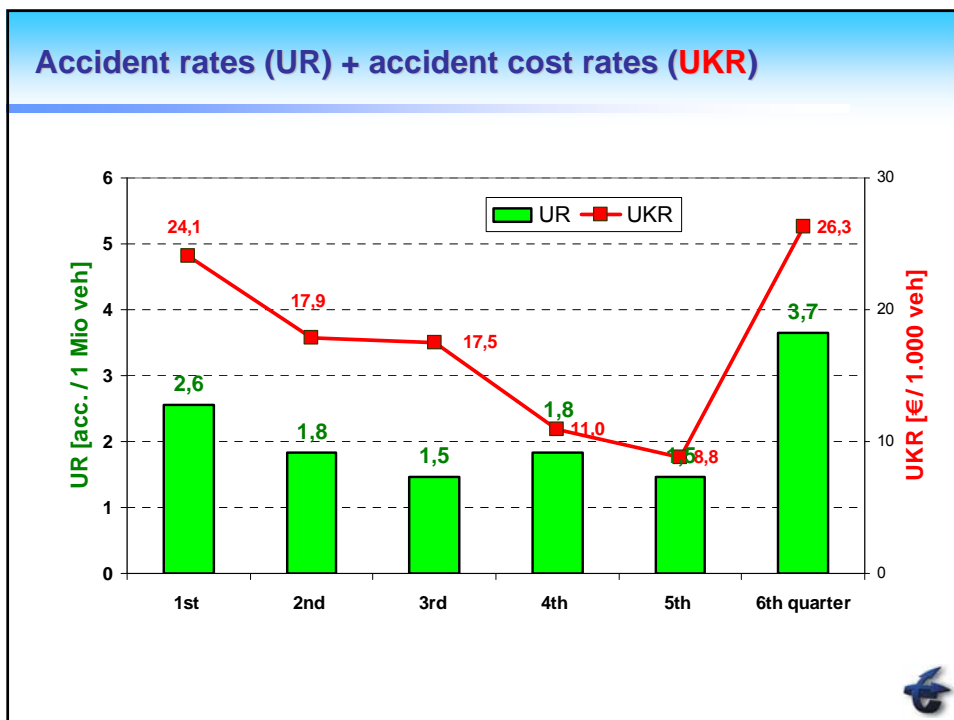


## Accidents ( 1.5 years )

The diagram illustrates a roundabout with four main approaches and a central island. The approaches are labeled as follows:

- Top approach:** "schopping mall" (likely shopping mall).
- Right approach:** "B 500 from City".
- Bottom approach:** "Cité (new housing area)".
- Left approach:** "B 500 from A 5".

Accident locations are marked with numbers 1 through 35. A blue arrow points to accident 22 on the left approach. A north arrow is located in the top right corner. A small blue icon of a car is in the bottom right corner.



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

	UR [acc. / 10 <sup>6</sup> veh]	UKR [EURO / 1.000 veh]
Turbo-R. Baden-Baden	<b>2.1</b>	<b>17,60</b>
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

