Strategies for Wildlife protection along Qinghai-Tibet expressway in China

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Acknowledgements

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China Academy of Transportation Sciences
• Outline

  o Wildlife and transportation infrastructures in Tibetan Plateau
  o Impacts of transportation infrastructures on wildlife
  o The strategies to protect wildlife along the expressway during and after the construction
• Wildlife and transportation infrastructures in Tibetan Plateau
- **Wildlife and transportation infrastructures in Tibetan Plateau**
  
  - **Main wildlife species**
    - Tibetan antelope (IUCN: NT)
      - Long distance migration species

- May-June
- July-August
- **Wildlife and transportation infrastructures in Tibetan Plateau**
  - Main wildlife species
    - Tibetan gazelle (IUCN: NT)
    - Wild yak (IUCN: VU)
    - Kiang (IUCN: LC)
• **Wildlife and transportation infrastructures in Tibetan Plateau**
  
  o Transportation infrastructures

• Qinghai-Tibet highway: 1950-1954

• Qinghai-Tibet railway: 2001-2006

• Qinghai-Tibet expressway: near future

Three parallel roads + Wildlife
What are the impacts?
• Impact of transportation infrastructures on wildlife
  
  o Road kill

  • 2004-2012, May-August, migration season
  • Hot spots: K2994-K2999
  • Number: 13
• Impact of transportation infrastructures on wildlife
  • Road kill
• Impact of transportation infrastructures on wildlife

○ Width of passages of Tibetan antelope migration was shorten by the overlapping effect of highway and railway

Before construction of railway K2974-K3000
>20 km

During construction of railway K2980-K3000
>10 km

After operation of railway K2998
< 1 km

Factors: ①distance; ②landform: hide area; ③habitat quality

(Wang et al, 2017)
Impact of transportation infrastructures on wildlife

Delay in the migration period of Tibetan antelope

Each time, after reaching the highway and railway, the antelopes spent 20–40 days in that area, probably looking for passages and waiting

(Buho et al, 2011)
• Impact of transportation infrastructures on wildlife
  
  - Wildlife may get used to the disturbance of the roads and railway

  ![Graphs showing road avoidance distance for different wildlife species](image)

  - Tibetan antelope
  - Kiang
  - Tibetan gazelle

  Road avoidance distance
What should we do?

The strategies
• Wildlife protection along expressway

- Road avoidance distance: 265.58 ± 11.07m
- Hide area
- Habitat quality
- Existence of crossings along railway

Keep the expressway far away from existing highway and railway as far as possible
• Wildlife protection along expressway

Median strip

Key section: K2980-K3000

Divided vs. undivided highways

➢ Tibetan antelope: diurnal animals
• Divided highways: light is better
• Experimental bridge: two lanes (width 10m, height 5m), successful

• Divided highway
• The Width of median strip is 50-100 m to help Tibetan antelope to cross the road ASAP
• Wildlife protection along expressway

➢ Wildlife crossing structures

• 51 infrared cameras
• 2014-2016
• 14 small bridges, 11 culverts, 1 big bridge

(Wang et al, 2017; 2018)
• Wildlife protection along expressway

➢ Wildlife crossing structures

Migration season of Tibetan antelope

Key section: K2980-K3000

Type: overpass and underpass
Height > 5 m
Openness index > 129
Other measures: noise barrier, vegetation restoration, alert sign, etc.

openness index = Height × Width / Length

Experimental bridge, K2998

Relationship between height and crossing number

Wildlife crossing structures
• Wildlife protection along expressway

➢ Wildlife crossing structures

No migration season of Tibetan antelope

**Height > 3.5 m**

**Width > 6 m**

**Openness index > 4.2**
• Wildlife protection along expressway

➢ Wildlife crossing structures

Tibetan gazelle, Kiang, etc

✓ Type: overpass and underpass

✓ Other measures: noise barrier, vegetation restoration, alert sign, etc.

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<th>Species</th>
<th>Openness Index</th>
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<tr>
<td>Kiang</td>
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<tr>
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Thank you for your attention!

Any questions?

Email is better
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