On the Successful Implementation of Mitigation Measures

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Issues: *effectiveness of EIA*

- **focus has shifted from accuracy of impact predictions to our ability of effectively preventing environmental degradation**

- **depends on full implementation of mitigation and other management measures**

Case study

construction of a highway crossing tropical rainforest and steep slopes in São Paulo State, Brazil

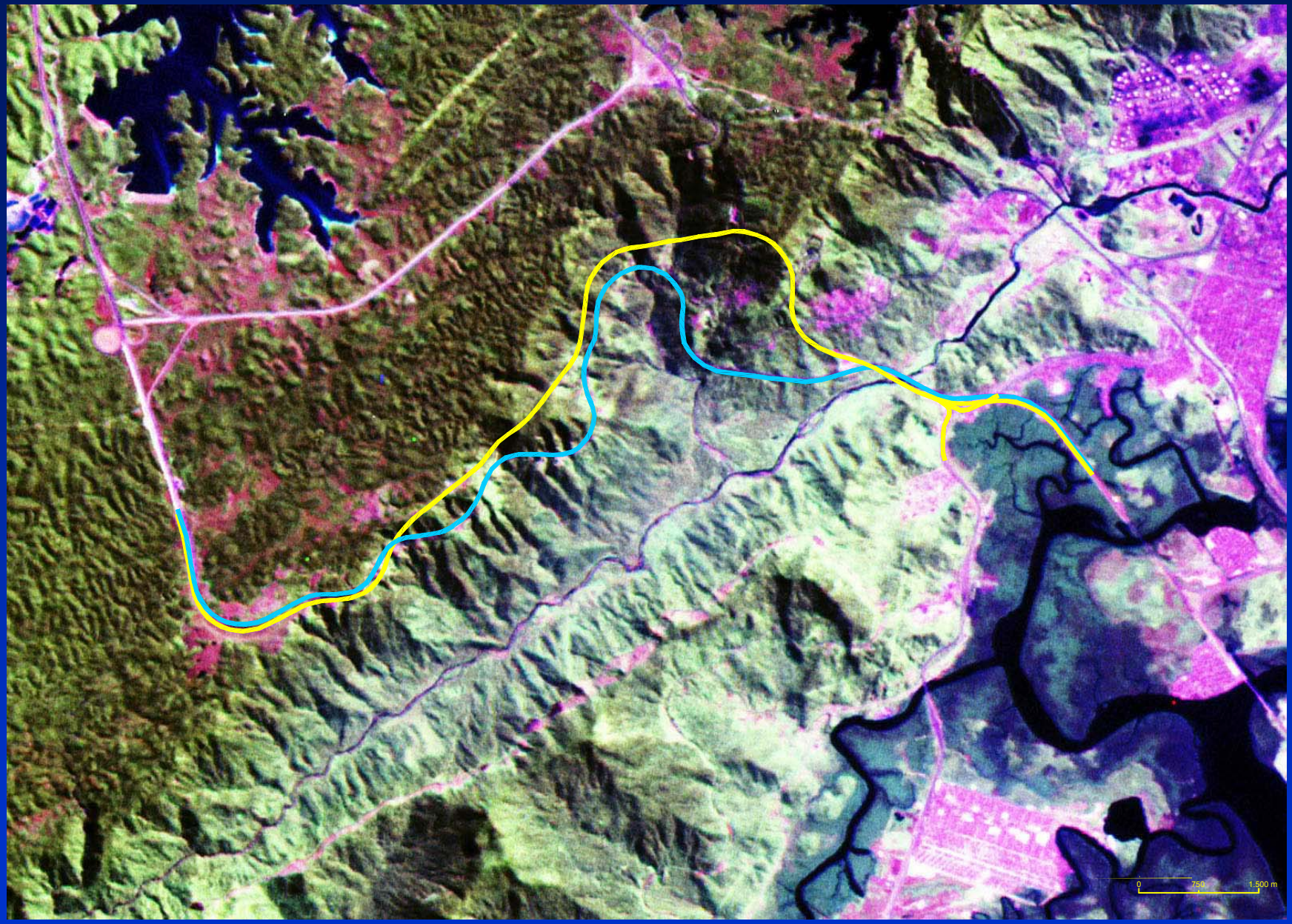
Case study: *Imigrantes Highway*

previous studies showed that environmental monitoring and follow-up received particular attention due to:

- ✓ **high visibility**
- ✓ **sensitive environment:**
  - ➔ **State Park**
  - ➔ **rainforest (biodiversity, endangered species)**
  - ➔ **water resources for public supply**
  - ➔ **steep slopes (risks of landslides)**

The project

- Construction of a three-lane highway through a State Park in forested steep slopes
- ~ 17 km (+4 km)
- 3 tunnels – 8231m
- 9 viaducts – 4270 m
- cut and fill – 4623 m
- Construction took place between Sep 1998 and Dec 2002


0
750
1.500 m

Monitoring provisions

- **Physical environment:**

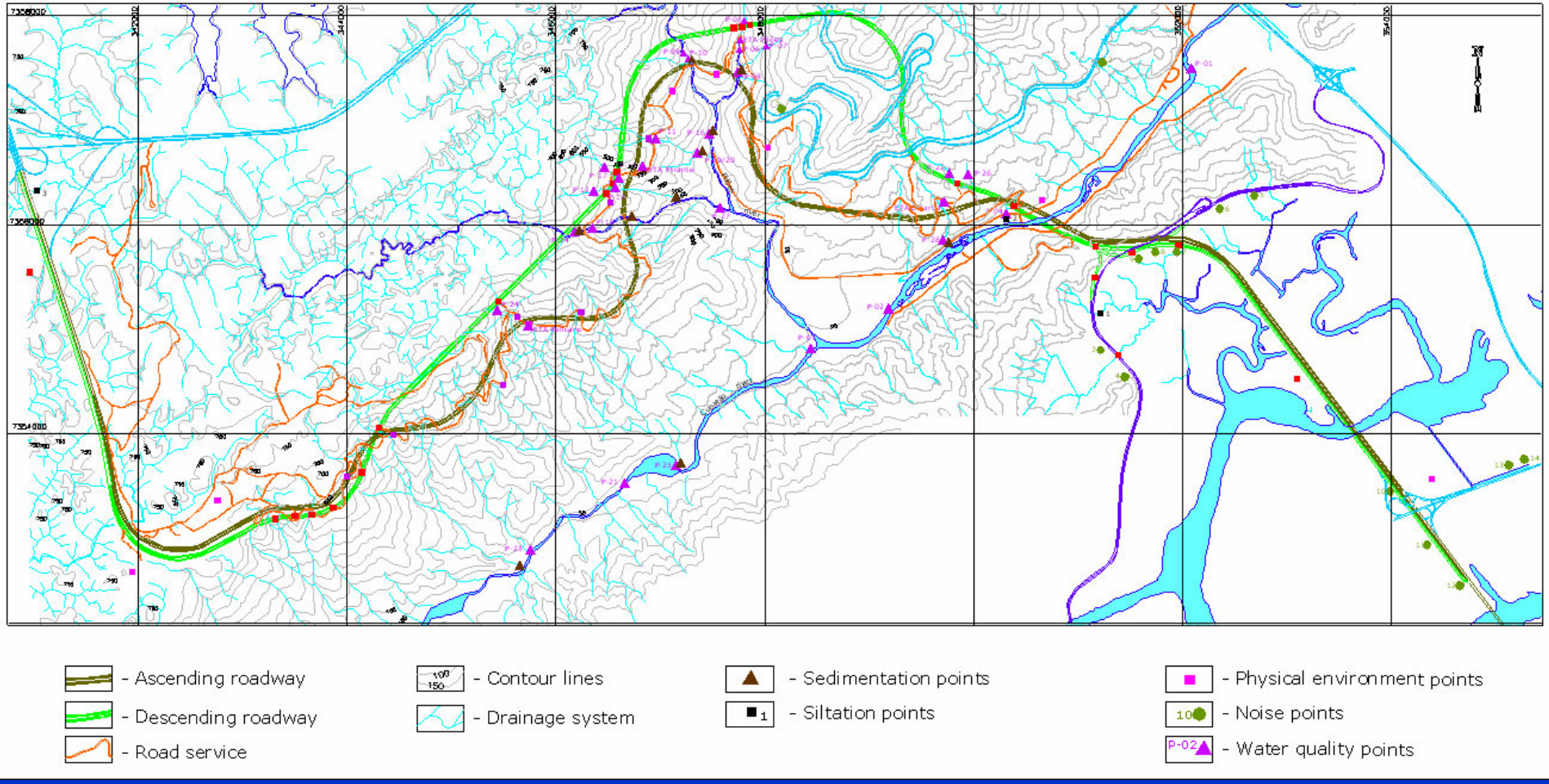
conducted through field inspections

- ✓ **slope protection, sediment traps**
- ✓ **evidence of erosional or instability processes**
- ✓ **volume and dimension of landslides**

Monitoring provisions

- **Water quality: 27 control points**
  - 9 upstream/18 downstream
- **Noise: 14 control points**
- **Fauna surveys: around major construction points**
- **Vegetation loss: actual cut down surface**

Monitoring stations



Monitoring results: major findings

- ***Physical environment***
  - **sediment traps retained eroded soils**
  - **river siltation observed in only one point: sediments removed**
  - **only minor landslides (< 100 m^3)**

no significant impact on physical environment

Monitoring results: major findings

- ***Water quality - pH***
  - **out of 1220 water samples, 475 (38,9%) exceeded quality standards for pH (6.5<pH<7.5)**
  - **these 475 samples 1/3 are located upstream and 2/3 downstream: alcaline results mostly downstream ---- unpredicted impacts of tunneling**

4 wastewater treatment plants built

Monitoring results: major findings

- ***Water quality – turbidity and colour***
  - **out of 1220 water samples, 17 (1,4%) exceeded quality standards for turbidity (<150 NTU)**
  - **out of 1220 water samples, 27 (2,2%) exceeded quality standards for colour (<200mg Pt/L)**

drainage system and sediment traps have been effective in preventing sediment transport

protecting exposed slopes

aggregate stockpile and wastewater treatment plant

Monitoring results: major findings

- ***Vegetation loss***
  - **40 ha of forest cut down**

in accordance with license terms

amount 40 times lower than vegetation loss during construction of old highway (1970s)

nevertheless, 8 nonconformities for cutting before receiving specific authorization

reducing loss of natural vegetation

Monitoring results: major findings

- ***Fauna***
  - **mammal, reptile and bird surveys identified more species than baseline surveys**
  - **93 running-overs during construction, mostly affecting rodents and serpents**
  - **111 individuals transferred to other parts**

impacts of construction works over fauna have been minor

Reasons for success

- **effective follow-up through intense supervision and reporting**
- **complementary roles played by environmental professionals within government agencies, consultancy and the contractor**
- **existence of an environmental management system for construction showing "documental proof that all mitigation and preventative measures have been adequately implemented"**

Reasons for success

- **a combination of internal and external factors led to the successful implementation of mitigation and management measures:**
  - ✓ **overseeing carried out by government agencies**
  - ✓ **threats of administrative and judicial measures if unjustified incompliance (case of water pollution) – risks of stopping construction**
  - ✓ **clear duty of monitoring and reporting**
  - ✓ **public interest**

Lessons

- **a management system is a powerful tool to successfully carry on the implementation of mitigation and other management measures**
- **complex projects built in sensitive environments need a robust follow-up scheme to detect and correct any unpredicted impact**
- **external control is essential to guarantee the successful implementation of mitigation measures**

Previous work

- GALLARDO, A.L.C.F.; SÁNCHEZ, L.E. Environmental follow-up of a road building scheme in a fragile environment. *Environmental Impact Assessment Review* 24:47-58, 2004.