2024-2027PIARC T.C.3.4.
説明資料

委員　：曽根真理（現㈱フジタ、元国総研　道路環境研究室長）

１．今タームの活動状況と今後の予定

1)S.T.3　　安全と持続可能性

ST3は、安全と環境を戦略テーマとしている。

コーディネーターは田村様

TC 3.1 Road Safety :交通安全

TC 3.2 冬季管理

TC 3.3 アセットマネジメント

TC 3.4 環境持続可能性

TC 3.5 脱炭素

Home » Discovering PIARC » Technical Committees » Strategic Theme 3 - Safety and Sustainability

Strategic Theme 3 - Safety and Sustainability

Road safety and sustainability are important issues that need to be addressed in road operations. There are several key areas that need to be considered in order to ensure that roads are safe and sustainable for all users. Road safety and sustainability are important issues to be addressed in road operations. Approximately 1.35 million people lose their lives while driving, cycling, or walking on the road every year. Another 50 million are seriously injured, and many are left permanently disabled as a result. Roads have significant sustainability issues, including environmental impacts, such as air pollution and climate change, and impacts on ecosystems. Road safety is also a critical sustainability issue, with the loss of life and productivity costing countries productive opportunities.

Strategic Theme 3 "Safety and Sustainability" addresses issues that are integral to planning, design, construction, operation, maintenance, and use of the road system. The five key issues for this committee are addressed by this Strategic Theme.

Technical Committees

- » TC 3.1 Road Safety
- » TC 3.2 Winter Service
- » TC 3.3 Asset Management
- » TC 3.4 Environmental Sustainability of Road Infrastructure and Transport
- » TC 3.5 Road infrastructure for road transport decarbonization

WORKSPACE

» Reserved to Coordinator, Presidents and Secretaries of Theme 3

STRATEGIC THEME 3 COORDINATOR

Keiichi TAMURA (Japan)

2)S.T.3.4　環境持続可能性

環境問題に取り組んでいます。大気汚染、騒音、生物多様性という伝統的なテーマに取り組みます。

座長は前タームに引き続きエリック・ディムヌ（フランス）が就任します。

ST 3.4.1:大気汚染

ST 3.4.2:騒音

ST 3.4.3:生物多様性

Issues

- 3.4.1 Air pollution mitigation and zero/low emission zones
- 3.4.2 Noise pollution
- 3.4.3 Road and road transport impact on wildlife and biodiversity

Chair and Secretariat

- Chair: Eric DIMNET (France)
- English-speaking Secretary: Fiona WILSON (United Kingdom)
- French-speaking Secretary: Paul-Yanic LAQUERRE (Canada-Québec)
- Spanish-speaking Secretary: Maria Norma FERNÁNDEZ BUCES (Mexico)

TC 3.4.3 への参加理由

●参加国

TC3.4全体の参加国数は40か国、参加人数は100名以上

TC3.4.3の参加者は、28か国

●日本は、以下の理由により3.4.3 自然に参加

- 前タームにおいても参加していたこと。
- 大気、騒音に関しては国際情報収集の必要性が相対的に低いが、自然分野に関してはネイチャーポジティブ（環境復興）などに関し国際的な情報収集が必要であること。
- 我が国に十分な研究実績があり、国際貢献が容易なこと。

●日本からの委員

・委員：曽根　真理（㈱フジタ、元国総研道路環境研究室長）

・連絡委員：留守　洋平（道路局　環境安全・防災課　道路環境調整官）

・若手委員：一丸　結夢（国総研　道路交通研究部　道路環境研究室　主任研究官）

TC 3.4　会議開催状況

これまでに２回会合が行われた。

第1回：2024年1月、フランス国パリ市：顔合わせ
第2回：2024年11月、web　：テーマ募集
第3回：2025年春、ウィーン？

第2回はWebで行われた。
参加者は14名、欠席14名？

出典：2020年11月2日　PIARC事務局提供資料

TC 3.4.3 第2回会合のポイント

テーマ１：気候変動と道路と生物多様性の関係

1)今後は気候変動及び道路が生物多様性に与える影響を考慮する

2)緩和及び補償措置について調査する

3)太陽光発電設備の導入による生態系への影響

テーマ２：騒音及び振動と生物多様性の関係

1)建設中の騒音振動も対象

2)光、匂いなどの影響も

テーマ３：生物多様性に対する累積的影響

1)影響の定義

テーマ４：外来種

1)侵略的外来種

２．有益と考えられる内容
３．日本の強みや弱み

2．有益と考えられる内容

日本の状況：

　日本国内においては、mitigation（緩和措置）が功を奏し、道路による生物多様性への悪影響が相対的に減少しつつある。

　nature positive（自然再興）など、道路が生物多様性に与える積極的な影響について注目が集まりつつある。

目標とする成果：

　日本の理論・事例を周知することで各国に貢献する。

　nature positive （自然再興）関連の理論・事例を収集する。

３．日本の強みや弱み

●日本の強み：

過去において緩和措置を行ってきた。数十年が経過し、mitigation(影響緩和)からnature positive(自然再興）へ貢献する段階になりつつある。

外来種関連の考え方も含めて道路法面の自然植生の復興などはまさしくnature positive（自然再興）であるといえる。

●背景（弱み？）：

都市内における環境貢献（大橋JC）の話をしたが興味をひかなかった。各国の道路管理者が都市間道路中心であることが原因。都市公園(Garden)は生物多様性(bio-diversity)に貢献するものではないことも原因。

●目標とする成果：

都市間交通が中心となるため、都市間（郊外）におけるnature positive(自然復興) について着目し、日本からの情報発信及び国外の情報収集を行いたい。

日本からのテーマ別貢献方針

テーマ１：気候変動と道路と生物多様性の関係

→無理やりのテーマ設定という感がある。

テーマ２：騒音及び振動と生物多様性の関係

→オオタカ等の事例があり、事例及び理論で貢献可能

テーマ３：生物多様性に対する累積的(cumulative)影響

・日本国内プロジェクトのモニタリングの結果を報告。

・国外からnature positive（自然再興）等の事例があれば収集。

・mitigation（影響緩和）からnature positive（自然再興）への変化

テーマ４：外来種

→特定外来種除去の事例があり、事例及び理論で貢献可能

４．アウトプット（技術基準等）

４．アウトプット（技術基準等）

●nature positive（自然再興）を意識した、事例・理論の収集

●日本の技術基準への反映について

・道路環境影響評価の技術基準（国総研資料）で理論が先行

・mitigation（影響緩和措置）後、数十年が経過し、nature positive（自然再興）の事例が徐々に出現しつつある状況。

・事後評価事例を取集・分析することにより、道路環境影響評価の技術基準を改良することが目標。

５．前タームの報告（参考）

前タームのまとめ

前タームのWG（作業部会）構成は今タームと同じ。

日本では、対策面でピークを過ぎたと思われる沿道における大気や騒音問題が、発展途上国においては依然として深刻であることを反映している。

テーマ選定自体は、PIARCが西欧諸国の集まりから世界的活動組織になっていることを示す好例だといえる。

↓

TC 3.4.1:大気汚染、TC 3.4.2:騒音は、報告書提出には至らなかった。

TC 3.4.3：生物多様性は報告書を作成した。

T.C.3.4.3　前ターム報告書

伝統的な内容。日本から見ると目新しいものはない。

日本の成果をもって、貢献した。（左図：環境影響、中図：横断、右図：緩和措置）

species due to the modification of foraging grounds, food shortage, decrease in the number of mates available for breeding and decrease in the breeding rate due to the modification of breeding grounds, decrease in the number of individuals available for habitat due to the modification of roosts, and results of these. There are concerns that the number of inhabiting individuals in the area (the project area of influence) may decrease or become extinct as a result of these factors (Fig. 4.1).

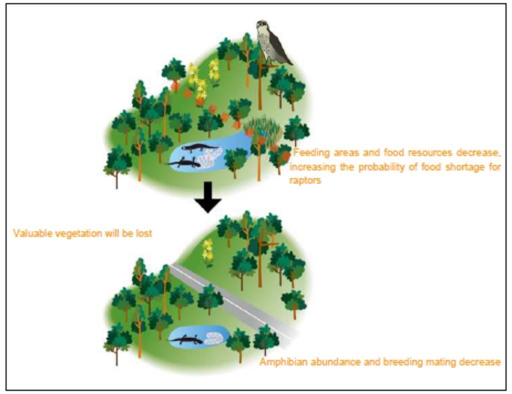

Figure 4.1: Examples of loss or reduction of habitat and habitat growth, etc. Top: Before construction of the road, and Bottom: After construction of the road (Source: [5])

Wide-ranging wildlife, those found in relatively low densities, or others with low reproductive rates, tend to be the most sensitive to habitat loss. Wide- ranging carnivores are particularly vulnerable to road impacts for such reasons, and thresholds of linear transport infrastructure are known to limit some of these species distributions. The principal part of the road, where traffic runs, affects a strip 50m wide approximately, that produces a loss of 5ha habitat/km.

4.2.1.2. Fragmentation and Barrier effect

These effects induce the most important negative ecological impacts. Roads are linearly constructed projects, which may divide the habitats and growing areas of animals and plants, and the spheres of activity and movement routes of animals. Therefore, in road projects, it is necessary to give consideration to the movement routes of animals and to pay sufficient attention to the fragmentation of their living and behavioural areas.

Animals use a variety of places for different purposes, such as feeding, watering, roosting and breeding grounds. An animal species can live only if all of these places exist within a single sphere of activity. In particular, large and medium-sized mammals, which have a wide range of behaviours, may have a very wide range of behaviours, and if their habitat is divided by the construction of a road, there is a high possibility that the species will not be able to survive in that area (Fig. 4.2).

According to species behaviour, the barrier effect may not only be physical. High traffic volume can modify animal behaviour, which tends to avoid noise or other annoyances by moving away from the infrastructure. Other times, they avoid the open areas that the road and its margins constitute. A subdivision of the population is generated, because they distribute between one side and the other of the infrastructure, or there is a big difficulty for animals to reach the resources they need if they are located on the opposite side of the road.

Because of this barrier effect, the gene flow can be disrupted which leads to genetic isolation, inbreeding and population extinction in the long term.

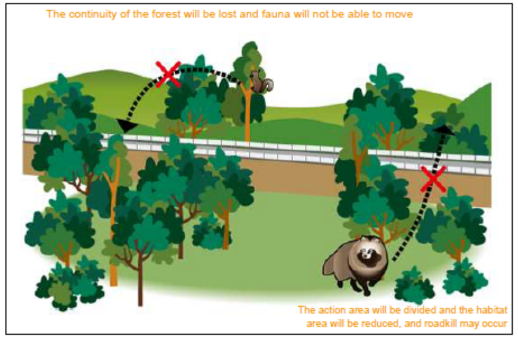

Figure 4.2: Example of the barrier effect (Source: [5])

4.2.1.3. Wildlife Traffic Mortality

Wildlife-vehicles collisions constitute one of the major sources of animal mortality directly linked to human activities. It is especially important in the case of insects, amphibians and reptiles, but also remarkable in birds and medium and large mammals (Fig. 4.3). This is part of the barrier effect that infrastructures imply by making difficult or impeding the movement of different species, reducing the genetic exchange between them.

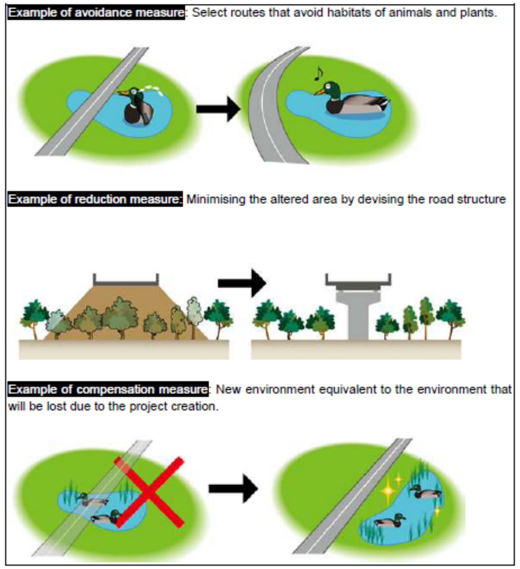

Figure 7.1: Examples of avoidance, reduction and compensation measures (Source: [4])

- **Offsetting/compensation** consists of compensatory measures taken to offset any significantly adverse residual impacts that could not be avoided, reduced, or restored/rehabilitated so that there is no net biodiversity loss or there is a net biodiversity gain. Examples of offsetting/compensation are post-development restoration works, ex-situ measures (captive breeding and plant seed banking), and translocation and/or reintroduction of species.

Recommendation: Prioritise degraded natural habitat for restoration over healthy habitat for mitigation to ensure a real net gain for compensation.

T.C.3.4.3　前ターム報告書

各国の考え方は日本とほぼ同じ。

左図：検討サイクル（PDCA）、中図：SEAからモニタリングまで、右図：オーバーパス・アンダーパス

6. STUDY MANAGEMENT DURING THE LIFECYCLE OF ROAD INFRASTRUCTURE

A correct management of the studies during all phases in a road project lifecycle is crucial to avoid or at least reduce all main impacts generated during the road lifecycle. This chapter details all phases of a road project lifecycle and the study management during these phases.

6.1. WHAT ARE LIFE CYCLE PHASES OF TRANSPORT INFRASTRUCTURE PROJECTS?

From the decision to build a road to its exploitation and eventually to its decommissioning, in many countries, generally five phases follow each other (Fig. 6.1). Upgrading phase is apart from this cycle (Fig. 6.1) because it restarts another cycle from the design phase.

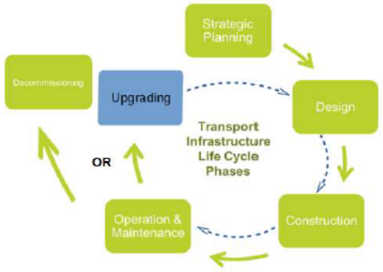

Figure 6.1: life cycle phases of infrastructure of transport project (adapted from BISON project)

Between the end of each phase, public consultancy procedures take place to obtain a "Go / No Go", from administration and inform the local population before starting the following phase. During these procedures, a balance about the major technical, economic and other environment related issues (water, air, humans, etc) including biodiversity stakes (fauna, flora and natural habitats) with maps of their geographical positions, and the localised effects of the project and the measures of mitigation to be applied are proposed. A compromise must be found between all these different interests. The details in information provided increase at each phase, being the most concise just before the construction phase.

The starting point of all further planning should also be serious and clear strategic planning, not only for infrastructure development but also concerning the valuable natural areas and the ecological corridors connecting them. To combat fragmentation of ecological corridors they need to be defined, publicly visible and legally protected. Real safeguarding of the corridors is only possible if they are legally protected by suitable spatial planning tools, as all stakeholders are obliged to implement all necessary measures to keep the functionality of the ecological corridors.

Unfortunately, that is rarely done in the different countries at this time.

8.2.2. During construction

Complementary inventories should be done where species or habitats are protected by laws and endangered to apply specific protection from accidental destruction, several weeks before construction phase starts (i.e. information panel and physical fences delineating protected flora species stations [= growing areas]) or their transplantation if destruction is not avoidable). These new measures need to be monitored during the construction phase. Therefore, ecological site surveillance needs to accompany the construction of the project as well as the implementation of the measures to make sure all works are done in an ecologically sound way.

Other kinds of monitoring must be implemented during this phase:

- all real impacts (direct destruction, dust on plants, engine noise…) on previously targeted species and habitats are mostly monitored during this phase.
- temporary measures as well as permanent measures (i.e. fauna passages, fences…) to also be monitored as soon as they are functional during this phase.

8.2.3. After construction

In many countries, monitoring ends at least 5 years (but 10 to 15 years are preferable) after construction during the maintenance/operation phase. During this phase, the measure effectiveness must be evaluated. If they are not efficient, a corrective adaptation of the mitigation measure must be proposed and tested if possible.

Compensation monitoring comes often late after construction in some countries (i.e. France…), usually because the project manager does not easily find all the compensation sites asked by the local authorities before the end of construction (lack of potential compensation sites, competition between projects…). This delay must be taken into account in their evaluations. The sites to be compensated must be monitored before and during the construction step. It provides with precision what will have to be compensated. Ideally, a major part of the compensation sites should have to be found before road construction, by the stakeholders or the authorities (e.g. local administrations) to gain time and to partly avoid an important overestimation in the price of these sites by the owners.

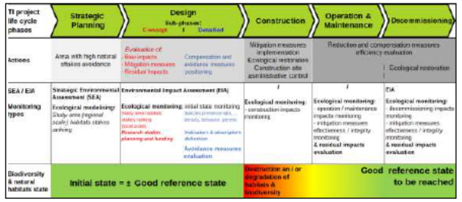

Figure 8.1: Evaluation/monitoring steps on life cycle of infrastructure of transport project (Source: Cerema in Biodiversity and Infrastructure. A handbook for action. IENE (in prep.))

- *Wildlife overpasses* (*fauna overpasses*, Fig. 7.7b) are structures over transport infrastructure that connect habitats on both sides of said infrastructure specifically providing a safe crossing point for wildlife at the population/metapopulation level. Structurally, these are narrower than landscape overpasses by convention. They are costly but are fairly effective at reducing fragmentation impacts.
- *Multiuse overpasses* are structures built over roadways that combine human and wildlife use. Since many small forestry or agricultural roads or cattle or pedestrian paths cross major transport infrastructures, they can be adapted to improve permeability and connectivity between habitats if the traffic intensity is low. However, these passages are no substitute for crossings designed and built specifically for wildlife that are free from human disturbances.
- *Treetop overpasses* (*canopy bridges*, Fig. 7.7c) are designed either by trees, rope-like ladder or walkway for climbing and/or arboreal species to allow them to cross the transport infrastructure above the traffic. These structures need to be wide and taut enough for animals to use with good connections to trees and/or bushes on either side of the roadway. They also need to be safe from predators and not be flammable.
- *Bat crossings* are apparatuses designed to facilitate safe passage over transport infrastructure for bats who particularly follow landscape elements such as trees. The effectiveness of these structures is unknown. Other measures such as underpasses, viaducts, and wildlife overpasses are recommended for bats.

Figure 7.7: Examples of providing links – (a) landscape overpass/green bridge (source: [18]); (b) wildlife crossing in Banff National Park, Canada (source: [16]); and (c) treetop overpass/canopy bridge (from the left to the right of the figure; source: [18]).

Underpasses are generally structures under the transport infrastructure, which are built mainly for drainage or human use; however, they can be adapted to connect separated habitats on each side of the infrastructure. They are often the best option for aquatic and semi-aquatic species and maintaining aquatic ecosystems (e.g., a stream or river); however, they are more challenging to vegetate due to the lack of sunlight. As many of these structures transport water, frequent inspections and maintenance are required to ensure they are functioning effectively for the target species.

目を引く事例

左図：哺乳類を感知して注意喚起する取り組み。雑誌道路で報告済み。
中図：DNA調査。日本でも行っている。 雑誌道路で報告済み。
右図：カリブー（オオツノジカ）の移動を妨げない。雑誌道路で報告済み。

The present case study regards the installation of innovative AVC prevention tools, namely:

1. Installation, in specifically identified sites, of AVC PS (Animal-Vehicle Collision Prevention System) (Fig. 1), which act simultaneously on the animals on the road sides and on the drivers. The AVC PS have the following functioning and structure (Figure 1): A set of passive infrared (PIR) sensors and/or a thermal camera (1) registers the presence of an approaching animal and sends the information to the electronic control unit (2). This unit triggers an alert signal for drivers (3), inviting them to slow down to an acceptable speed. A radar doppler sensor (4) measures whether the car actually slows down. If it does, the system stops to act. Otherwise, the radar sends a signal back to the control unit. This activates an acoustic scaring device (5), which shall drive the animal to escape.

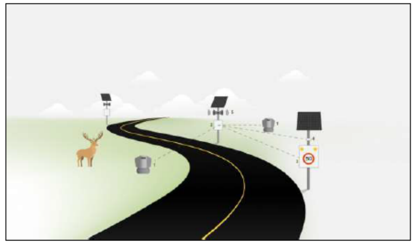

Figure 1: Functioning of the AVC PS system

The functioning of the system is controlled through a modem, which sends an email each time a component is triggered (wildlife presence sensors and acoustic scaring device), and also sends information about the charge level of the batteries. Moreover, remote information can be received about the functioning of the flashing lights, and on whether the passing vehicles slow down or not. A specific software has also been developed in order to collect all this type of information, as well as an App through which is possible to control and change the setting of the different components of the systems.

The added value of these systems is that they intervene only in risk situations, when there is the simultaneous presence of an animal on the road side and the approach of a car that proceeds at too high speed. This shall help to reduce habituation of both wildlife and the drivers, and it also favours environmental connectivity.

These devices have been developed and tested in Italy in the frame of the LIFE STRADE project (2012 – 2016), and in the frame of the LIFE SAFE-CROSSING project it is installed in 27 sites in the four project countries.

Figure 1: examples of different techniques dedicated to evaluate and monitor barrier effect in the vicinity of fauna passage in France (National Road number 2) - top left : audio recorder for bats; below : camera trap; top right : thermal camera with camera trap; below: sampling of eDNA. photos: cc by sa 4 Olivier PICHARD.

Figure 4: Caribou crossing at the Inuvik-Tuktoyaktuk highway near Jimmy Lake, Northwest Territories (NNSL, 2018)

8.4.3.2. Protecting Permafrost and Vegetation

Construction projects located on permafrost terrain are often situated on sensitive tundra, which can be severely damaged by simply moving equipment over it. It is therefore vital to minimize the construction “footprint” and implement an environmental management plan to cover such issues as tundra sensitivity, air quality and noise, terrain and vegetation, wildlife, fisheries and aquatic resources, waste management and fuel / oil management. The design of projects in permafrost areas should incorporate the best practices for long-term permafrost preservation (Fig. 5; TAC, 2010).

Vegetation impacts must also be addressed, to mitigate habitat and biodiversity degradation effects on longer highway developments, but also concerns related to permafrost protection. Recommended practices include limiting vegetation clearing in areas with permafrost, so that the shade provided by vegetation can prevent ground thaw. Tree clearing should be minimized to protect permafrost layers. Since such clearing is sometimes done with excavation equipment, ensuring that trees are not uprooted, exposing and thawing underlying soils is an important mitigation. Hand-cutting of trees is preferred for this reason. Brush disposal is another concern in permafrost areas. Chipping or mulching will add nutrients to the local soils, enhancing vegetation growth. Burning is not recommended in permafrost areas, since it could cause ground subsidence. Vegetation may also be retained to serve as a visual buffer between a public highway, and other land uses, as well as physical buffer from aquatic habitats.