



Annual Report 2022

Strengthening the fact-based approach:
A new set of target indicators to support the policy pathway



iMONITRAF! Annual Report 2022

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A new set of target indicators to support the policy pathway

INFRAS / Climonomics / Eurac Research with inputs of iMONITRAF! partners

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The iMONITRAF! year 2022 at a glance

iMONITRAF! – Only coordinated policies can tackle the transport challenge

The rebound of traffic volumes after the initial effects of the COVID-19 pandemic has highlighted the need for a stronger cooperation of the Alpine regions to tackle their common challenge of transalpine freight transport. Traffic volumes are back to the levels of 2019 and with them the pressure to develop effective and joint solutions to set stronger incentives for modal shift and to ensure that the Alpine regions can become a model for decarbonising road freight transport. Since 2005, iMONITRAF! has become a central knowledge-hub on transalpine transport, based on a strong data pool which is provided in the frame of the common monitoring system. But beyond that, iMONITRAF! has also a strong political voice by bringing together political decision makers to discuss relevant challenges and solutions and by using the common voice for pushing joint policy initiatives at national and European level.

A net set of target indicators to frame the policy pathway

Throughout the cooperation phase 2021-2022, iMONITRAF! partners have developed a new strategic basis to implement the Combined Scenario which brings together the positive impacts of both modal shift and technological change and has become the leading rationale for iMONITRAF!. As first step, a policy pathway was developed by iMONITRAF! in 2021 and discussed with decision makers at national and European level. However, this policy pathway did not include any specific targets or target indicators to set a clear direction for the final desired outcome. This shortcoming was tackled in 2022 and one major activity of the network was to develop a new set of target indicators – based on existing political strategies, scenarios or targets developed at regional and corridor level. These target indicators shall support the network in better communicating the success of measures taken so far but also in highlighting additional need for action. The new set includes target indicators and target paths for modal split, traffic volumes as well as the share of non-Diesel HGV. Developments in reaching the target indicators will, from now on, be highlighted each year in the frame of the Annual Reports.

Positive dynamics at European level to strengthen modal shift

The need for strengthening modal shift from road to rail is a corner stone of the European “Fit-for-55” Package which implements the EU Green Deal as well as the Sustainable and Smart Mobility Strategy. Throughout 2022, several policy initiatives were pushed forward to improve and streamline the incentive mechanisms at EU level for decarbonising the transport sector. The TEN-T Regulation as crucial framework for the development and funding of the trans-European transport network has a considerable leverage effect when it comes to the provision of high-quality rail infrastructures along the transalpine corridors. The need for strengthening the modal shift ambition of the TEN-T and to accelerate its implementation has been recognized by the European Parliament which has “upgraded” the initial proposal of the European Commission for the revision of the TEN-T Regulation. iMONITRAF! has been in close touch with decision makers at EU level to ensure that Alpine-specific needs are considered in the revision process.

Furthermore several policy initiatives with high relevance for iMONITRAF! were implemented at EU level in 2022 as part of the “Fit-for-55” package. This includes the new CO₂ emission standards for cars and vans, the revision of the Directive on Alternative Fuels Infrastructure and especially the new EU Emissions Trading System for Transport & Buildings which implements, for the first time, an EU-wide CO₂-price for the transport sector. The Combined Transport Directive as well as the Energy Taxation Directive also have many interfaces to the iMONITRAF! policy pathway but were not taken forward in 2022.

Monitoring update for the year 2021 – observing a rebound after the COVID-19 impacts

After the reduction of HGV volumes in 2020 due to the COVID pandemic, a rebound nearly to the pre-pandemic level was observed in 2021. About **23,700 heavy vehicles per day (HV/day)** crossed the seven major transalpine corridors, just 0.3% less than in 2019. Looking at the annual average daily traffic numbers of light vehicles, effects of the pandemic were still visible which is due to the travel restrictions still implemented throughout 2021. A total of **64,400 light vehicles per day (LV/day)** crossed the Alpine corridors, a reduction of 21.3% compared to 2019, but already a considerable rebound of 26.9% compared to the lower levels of 2020. The analysis of monthly data highlights the effects of mobility restrictions implemented by the involved Alpine regions and shows that the reduction of road traffic volumes experienced by heavy vehicles both in 2020 and 2021 is less evident than the one affecting light vehicles.

Transported goods on the iMONITRAF! corridors sum up to a total of about 165.9 mio. tons, 109.5 mio. tons by road (66%) and 56.4 mio. tons by rail (34%). The total amount registered in 2021 is by 11% higher than 2020 (first pandemic year) and even 4% higher than 2019 (last year before the pandemic). The modal split road-rail has slightly changed, with +1% in favour of rail. Despite the COVID pandemic, modal split on the Gotthard corridor could be further improved to 68% thanks to the now fully operational 4m corridor. The Simplon corridor still has the highest modal split for rail of 90%, all other corridors lie considerably lower: 31% at Tauern (a constant decrease over the last years), 27% at Brenner, 18% at Fréjus/Mt. Cenis and 3% at Ventimiglia.

The **annual air pollutant concentrations** of NO₂ show a further decreasing trend, the rebound in 2021 is not as pronounced as the one of traffic volumes as other positive effects also play a role – especially the increasing share of EURO VI vehicles. In 2021, the annual average values of NO₂ exceeded the EU annual limit value of 40 µg/m³ only for the Bressanone sud/Brixen süd station along the Brenner corridor. This is a meaningful difference compared to 2019, when five stations registered values above the EU annual limit. For PM₁₀ limit values have not been exceeded at any of the stations and **noise levels** slightly decreased due to the lower traffic volumes.

While monitoring data relates to 2021 when it comes to traffic volumes and environmental indicators, the **price-related monitoring indicators** relate to 2022 and already capture the effects of the Ukraine crisis. With the beginning of the war in Ukraine in February 2022, fuel prices have strongly increased even despite stabilisation measures introduced in various countries. The average price of diesel increased by 34% and petrol 95 increased by 23% (compared to 2021).

Best Practices 2022 – Exploiting all options

Transport policy frameworks were further developed and optimised in all iMONITRAF! regions throughout 2022. In Tyrol, exemptions for regional transport were phased-out in the frame of the sectoral driving ban and the ban of high-emitting HGV and strong efforts were put on improving public transport services. Along the Brenner, additional control centres for the enforcement of road transport standards were taken in operation. Also, infrastructure projects both for freight and passenger transport were further developed in 2022 with important milestones for the Brenner Base Tunnel and the opening of several mobility centres in the iMONITRAF! regions which support high-quality multimodal passenger transport. Improving cross-border mobility was a special focus in many measures of this years' Best Practice collection, especially ticketing solutions and services for cross-border commuters were further improved in 2022. Looking at innovative approaches to support the decarbonisation of freight transport, the Canton of Uri highlights how public procurement contracts can be linked to more ambitious sustainability criteria for transport services and thus provide new incentives. In the Italian regions, several digital solutions are also tested and supported for better slot management and steering traffic volumes on the Brenner axis.

iMONITRAF! Aktivitäten im Jahr 2022 – Das Wichtigste in Kürze

iMONITRAF! – Steigende Verkehrsvolumen lassen sich nur gemeinsam bewältigen

Der schnelle Wiederanstieg des Verkehrsaufkommens nach den Einschränkungen während der COVID-19 Pandemie zeigt erneut eindrucksvoll wie zentral eine starke Zusammenarbeit der Alpenregionen bei der Umsetzung von verkehrspolitischen Maßnahmen ist. Das Verkehrsaufkommen ist wieder auf das Niveau von 2019 geklettert und somit auch der Handlungsdruck für die Umsetzung von effektiven und koordinierten Lösungsansätzen – einerseits um Anreize für die Verkehrsverlagerung zu stärken und andererseits, um sicherzustellen dass die Alpenregionen sich als Modell für die Dekarbonisierung des Straßengüterverkehrs etablieren können. Seit 2005 hat sich iMONITRAF! zu einem zentralen Wissens-Hub für den alpenquerenden Verkehr entwickelt, die Basis dafür stellt der Datenpool des gemeinsamen Monitoringsystems dar. Darüber hinaus hat iMONITRAF! auch eine starke politische Stimme: politische Entscheidungsträger:innen sind eng in die Arbeit eingebunden um relevante Herausforderungen und Lösungsansätze koordiniert anzugehen und die gemeinsame Stimme wird gezielt genutzt, um politische Initiativen des iMONITRAF! Netzwerkes auf nationaler und europäischer Ebene voranzutreiben.

Neue Zielindikatoren als Leitplanken für den iMONITRAF! Policy-Pathway

Während der Kooperationsphase 2021-2022 haben die iMONITRAF!-Partner eine neue strategische Grundlage für die Umsetzung des kombinierten Szenarios entwickelt, das die positiven Effekte sowohl der Verkehrsverlagerung als auch des technologischen Fortschritts kombiniert und somit zum Leitmotiv für iMONITRAF! geworden ist. Als erster Schritt wurde von iMONITRAF! im Jahr 2021 ein Policy-Pathway (Politikpfad) entwickelt und mit Entscheidungsträger:innen auf nationaler und europäischer Ebene diskutiert. Dieser Policy Pathway enthielt jedoch bisher keine spezifischen Ziele oder Zielindikatoren, um das gewünschte Ergebnis klar zu definieren. Mit der Entwicklung eines neuen Sets von Zielindikatoren wurde diese Lücke im Jahr 2022 geschlossen. Das Set umfasst Zielindikatoren und Zielpfade für den Modal Split, das Verkehrsaufkommen (Anzahl SGF/Jahr) sowie den Anteil der nicht-Diesel betriebenen Fahrzeuge. Um Akzeptanz zu gewährleisten, beruhen diese neue Zielindikatoren auf bestehenden politischen Strategien, Szenarien oder Zielen der regionalen Ebene oder der Korridor-Kooperationen. Sie sollen das Netzwerk dabei unterstützen, den Erfolg der bisher getroffenen Maßnahmen besser zu kommunizieren, aber auch zusätzlichen Handlungsbedarf aufzuzeigen. Die Entwicklung bei der Erreichung der Zielindikatoren wird von nun an jedes Jahr im Rahmen des Jahresberichts präsentiert.

Neuer Schwung auf europäischer Ebene zur Stärkung der Verkehrsverlagerung

Eine deutlich umfassendere Verkehrsverlagerung von der Straße auf die Schiene ist ein Eckpfeiler des europäischen "Fit-for-55"-Pakets, mit dem der Grüne Deal der EU sowie die Strategie für nachhaltige und intelligente Mobilität umgesetzt werden. Im Laufe des Jahres 2022 wurden mehrere politische Initiativen voran gebracht, um die Anreizmechanismen auf EU-Ebene zur Dekarbonisierung des Verkehrssektors zu verbessern und besser aufeinander abzustimmen. Die TEN-V Verordnung als entscheidender Rahmen für die Entwicklung und Finanzierung des transeuropäischen Verkehrsnetzes haben eine erhebliche Hebelwirkung, wenn es um die Bereitstellung hochwertiger Schieneninfrastrukturen entlang der alpenquerenden Korridore geht. Das Europäische Parlament hat die Notwendigkeit einer stärkeren Verankerung der Verlagerungslogik im TEN-V Rechtsrahmen erkannt und hat dem ursprünglichen Vorschlag der Kommission für die Überarbeitung der TEN-V Verordnung diesbezüglich ein deutliches «Upgrade» verpasst. Auch

die Umsetzung des TEN-V Ausbaus soll beschleunigt werden. iMONITRAF! stand in engem Kontakt mit den Entscheidungsträger:innen auf EU-Ebene, um sicherzustellen, dass die alpen-spezifischen Bedürfnisse im Überarbeitungsprozess berücksichtigt werden.

Zudem wurden 2022 im Rahmen des «Fit-for-55» Pakets mehrere politische Initiativen mit hoher Relevanz für iMONITRAF! umgesetzt. Dazu gehören die neuen CO₂-Emissionsgrenzwerte für Pkw und leichte Nutzfahrzeuge, die Überarbeitung der Richtlinie über die Infrastruktur für alternative Kraftstoffe und insbesondere das neue EU-Emissionshandelssystem für Verkehr und Gebäude, mit dem erstmals ein EU-weiter CO₂-Preis für den Verkehrssektor eingeführt wird. Die Richtlinie über den kombinierten Verkehr und die Energiesteuer-Richtlinie weisen ebenfalls zahlreiche Schnittstellen zum iMONITRAF! Policy Pathway auf, wurden aber im Jahr 2022 nicht weiter vorangebracht.

Monitoring-Update 2021 – Wiederanstieg des Verkehrsvolumens nach COVID-19

Nach dem pandemiebedingten Rückgang des Schwerverkehrsaufkommens im Vorjahr wurde im Jahr 2021 ein Wiederanstieg fast auf das Niveau von 2019 beobachtet. Rund **23.700 Fahrzeuge pro Tag** (SGF/Tag) querten die sieben großen alpinen Korridore im Jahr 2021, nur 0,3% weniger als im Jahr 2019. Bei den leichten Fahrzeugen waren die Auswirkungen der Pandemie hingegen noch deutlich sichtbar, was auf die teilweise noch geltenden Reisebeschränkungen im Jahr 2021 zurückzuführen ist. Die Gesamtvolumen lag 2021 bei **64.400 leichten Fahrzeugen pro Tag** (LV/Tag) auf den alpinen Korridoren – ein Rückgang von 21,3% im Vergleich zu 2019, aber bereits ein deutlicher Anstieg von 26,9% im Vergleich zu den niedrigen Werten von 2020. Die Analyse der monatlichen Daten zeigt die Auswirkungen der Mobilitätsbeschränkungen und macht deutlich, dass der Rückgang des Verkehrsaufkommens bei den schweren Güterfahrzeugen sowohl 2020 als auch 2021 weniger deutlich ausfällt als bei den leichten Fahrzeugen.

Die auf den iMONITRAF!-Korridoren **transportierten Güter** beliefen sich im Jahr 2021 auf insgesamt 165,9 Mio. Tonnen, davon 109,5 Mio. Tonnen auf der Straße (66%) und 56,4 Mio. Tonnen auf der Schiene (34%). Die Gesamtmenge lag somit um 11% höher als 2020 (erstes Pandemie-jahr) und sogar 4 % höher als 2019 (letztes Jahr vor der Pandemie). Der **Modal Split Straße-Schiene** hat sich leicht verbessert, mit +1 Prozentpunkt zugunsten der Schiene. Trotz der COVID-Pandemie konnte der Modal Split auf dem Gotthard-Korridor dank des nun vollfunktionsfähigen 4m-Korridor weiter verbessert werden. Der Simplon-Korridor hat mit 90% immer noch den höchsten Modal Split auf der Schiene, alle anderen Korridore liegen deutlich darunter: 31% am Tauern (konstanter Rückgang in den letzten Jahren), 27% am Brenner, 18% am Fréjus/Mt. Cenis und 3 % an der Ventimiglia.

Die **jährlichen Luftschadstoffkonzentrationen** von NO₂ zeigen einen weiteren rückläufigen Trend. Der Wiederanstieg im Jahr 2021 ist nicht so ausgeprägt wie der des Verkehrsaufkommens, da auch andere positive Effekte eine Rolle spielen - insbesondere der zunehmende Anteil von EURO VI-Fahrzeugen. Im Jahr 2021 wurden die EU Jahresgrenzwerte für NO₂ von 40 µg/m³ nur an der Station Brixen Süd entlang des Brennerkorridors überschritten. Dies ist eine deutliche Verbesserung im Vergleich zu 2019, als die Werte an fünf Stationen über den EU-Grenzwerten lagen. Bei PM₁₀ wurden die Grenzwerte an keiner der Stationen überschritten und die Lärmbelastung ging aufgrund des geringeren Verkehrsaufkommens leicht zurück.

Während sich die Daten für alle Verkehrs- und Umweltindikatoren auf das Jahr 2021 beziehen, wird beim Monitoring der **preislichen Rahmenbedingungen** bereits das Jahr 2022 betrachtet. Mit dem Beginn des Krieges in der Ukraine im Februar 2022 sind die Treibstoffpreise trotz der in verschiedenen Ländern eingeführten Stabilisierungsmaßnahmen stark angestiegen. Der Durchschnittspreis für Diesel stieg um 34 % und für Benzin 95 um 23 % (im Vergleich zu 2021).

Best Practices 2022 - Alle Möglichkeiten werden ausgeschöpft

Die verkehrspolitischen Rahmenbedingungen wurden im Jahr 2022 in allen iMONITRAF!-Regionen dynamisch weiterentwickelt und optimiert. In Tirol wurden die Ausnahmeregelungen für den Regionalverkehr im Rahmen des sektoralen Fahrverbots sowie des Emissionsklassen-Fahrverbots schrittweise abgebaut und das Angebot im öffentlichen Verkehr weiter verbessert. Entlang des Brenners wurden zudem zusätzliche Kontrollstellen für die Durchsetzung bestehender technischer und sozialer Standards in Betrieb genommen. Wichtige Infrastrukturprojekte sowohl für den Güter- als auch für den Personenverkehr erreichten 2022 wichtige Meilensteine. Beim Brenner Basistunnel begann der Bau am wichtigen Bauabschnitt «H41 Sillschlucht-Pfons» mit einer Tunnellänge von 22,5 m und zur Verbesserung im multimodalen Personenverkehr wurden in den iMONITRAF! Regionen mehrerer Mobilitätszentren eröffnet.

Die Verbesserung der grenzüberschreitenden Mobilität war ein besonderer Schwerpunkt bei vielen Maßnahmen der diesjährigen Best-Practice-Sammlung, vor allem Ticketing-Lösungen und Angebote für grenzüberschreitendes Pendeln wurden 2022 weiter verbessert. Mit Blick auf innovative Ansätze zur Unterstützung der Dekarbonisierung des Güterverkehrs zeigt der Kanton Uri auf, wie öffentliche Beschaffungsaufträge mit ehrgeizigeren Nachhaltigkeitskriterien für Verkehrsdienstleistungen verknüpft werden können und so neue Anreize schaffen. In den italienischen Regionen werden ebenfalls mehrere digitale Lösungen für ein besseres Slot-Management und die Steuerung des Verkehrsaufkommens auf der Brennerachse getestet und unterstützt.



iMONITRAF! nel 2022: L'essenziale in breve

iMONITRAF! - Solo politiche coordinate possono affrontare la sfida dei trasporti

La ripresa dei volumi di traffico dopo gli effetti iniziali della pandemia COVID-19 ha evidenziato la necessità di una maggiore cooperazione tra le regioni alpine per affrontare la sfida comune del trasporto merci transalpino. I volumi di traffico sono tornati ai livelli del 2019 e con essi la pressione a sviluppare soluzioni efficaci e congiunte per stabilire incentivi più forti per il trasferimento modale e per garantire che le regioni alpine possano diventare un modello per la decarbonizzazione del trasporto merci su strada. Dal 2005, iMONITRAF! è diventato un polo centrale di conoscenza sul trasporto transalpino, basato su un solido insieme di dati forniti nell'ambito del sistema di monitoraggio comune. Oltre a questo, iMONITRAF! ha anche una forte vocazione politica, riunendo i decisori per discutere le sfide e le soluzioni rilevanti e utilizzando la voce comune per promuovere iniziative politiche congiunte a livello nazionale ed europeo.

Una serie netta di "indicatori target" per inquadrare il percorso politico

Nel corso della fase di cooperazione 2021-2022, i partner di iMONITRAF! hanno sviluppato una nuova base strategica per l'attuazione dello Scenario Combinato, che riunisce gli impatti positivi del trasferimento modale e del cambiamento tecnologico ed è diventato la logica principale di iMONITRAF! Come primo passo, iMONITRAF! ha sviluppato un percorso politico nel 2021 e lo ha discusso con i decisori a livello nazionale ed europeo. Tuttavia, questo percorso non includeva obiettivi specifici o indicatori per definire una direzione chiara per il risultato finale desiderato. Questa lacuna è stata affrontata nel 2022 e una delle principali attività della rete è stata quella di sviluppare una nuova serie di "indicatori target" - basati su strategie politiche esistenti, scenari o obiettivi sviluppati a livello regionale e di corridoio. Questi indicatori target sosterranno la rete nel comunicare meglio il successo delle misure adottate finora, ma anche nell'evidenziare ulteriori necessità di azione. Il nuovo set comprende "indicatori e percorsi target" per la ripartizione modale, i volumi di traffico e la quota di mezzi pesanti non diesel. Gli sviluppi nel raggiungimento degli indicatori target saranno d'ora in poi evidenziati ogni anno nell'ambito dei report annuali.

Dinamiche positive a livello europeo per rafforzare il trasferimento modale

La necessità di rafforzare il trasferimento modale dalla strada alla ferrovia è una pietra miliare del pacchetto europeo "Fit-for-55", che attua il Green Deal dell'UE e la Strategia per la Mobilità Sostenibile e Intelligente. Nel corso del 2022 sono state portate avanti diverse iniziative politiche per migliorare e razionalizzare i meccanismi di incentivazione a livello europeo per la decarbonizzazione del settore dei trasporti. Il regolamento TEN-T, in quanto quadro fondamentale per lo sviluppo e il finanziamento della rete di trasporto transeuropea, hanno un notevole effetto leva quando si tratta di fornire infrastrutture ferroviarie di alta qualità lungo i corridoi transalpini. La necessità di rafforzare l'ambizione di trasferimento modale della TEN-T e di accelerarne l'attuazione è stata riconosciuta dal Parlamento Europeo, che ha "aggiornato" la proposta iniziale della Commissione Europea per la revisione del regolamento TEN-T. iMONITRAF! è stato in stretto contatto con i responsabili delle decisioni a livello europeo per garantire che le esigenze specifiche delle Alpi siano considerate nel processo di revisione.

Nel 2022 sono state inoltre attuate diverse iniziative politiche di grande rilevanza per iMONITRAF! nell'ambito del pacchetto "Fit-for-55". Tra queste figurano i nuovi standard di emissione di CO₂ per auto e furgoni, la revisione della direttiva sulle infrastrutture per i combustibili alternativi e soprattutto il nuovo sistema di scambio di quote di emissione dell'UE per i trasporti e gli edifici che implementa, per la prima volta, un prezzo di CO₂ a livello europeo per il settore dei trasporti. Anche la direttiva sul trasporto combinato e la direttiva sulla tassazione dell'energia presentano

numerose interfacce con il percorso politico di iMONITRAF! ma non sono state portate avanti nel 2022.

Aggiornamento del monitoraggio 2021 – un rimbalzo dopo gli impatti del COVID-19

Dopo la riduzione dei volumi di mezzi pesanti nel 2020 a causa della pandemia COVID, nel 2021 è stato osservato un rimbalzo quasi al livello pre-pandemia. **Circa 23.700 veicoli pesanti al giorno** (HV/giorno) hanno attraversato i sette principali corridoi transalpini, solo lo 0,3% in meno rispetto al 2019. Osservando i numeri del traffico medio giornaliero dei veicoli leggeri, gli effetti della pandemia erano ancora visibili, a causa delle restrizioni di viaggio ancora applicate per tutto il 2021. Un totale di **64.400 veicoli leggeri al giorno** (LV/giorno) ha attraversato i corridoi alpini, con una riduzione del 21,3% rispetto al 2019, ma già con un notevole rimbalzo del 26,9% rispetto ai livelli più bassi del 2020. L'analisi dei dati mensili evidenzia gli effetti delle restrizioni alla mobilità attuate dalle regioni alpine coinvolte e mostra che la riduzione dei volumi di traffico stradale sperimentata dai veicoli pesanti sia nel 2020 che nel 2021 è meno evidente di quella che interessa i veicoli leggeri.

Le **merci trasportate** sui corridoi iMONITRAF! ammontano a un totale di circa 165,9 milioni di tonnellate, 109,5 milioni di tonnellate su strada (66%) e 56,4 milioni su rotaia (34%). La quantità totale registrata nel 2021 è superiore dell'11% rispetto al 2020 (primo anno di pandemia) e addirittura del 4% rispetto al 2019 (ultimo anno prima della pandemia). La ripartizione modale strada-ferrovia è leggermente cambiata, con un +1% a favore della ferrovia. Nonostante la pandemia COVID, la ripartizione modale sul corridoio del Gottardo potrebbe essere ulteriormente migliorata fino al 68% grazie al corridoio di 4 metri ora pienamente operativo. Il corridoio del Sempione ha ancora la più alta percentuale per la ferrovia, pari al 90%, mentre tutti gli altri corridoi mostrano valori notevolmente inferiori: 31% ai Tauri (in costante diminuzione negli ultimi anni), 27% al Brennero, 18% al Fréjus/Mt. Cenis e 3% a Ventimiglia.

Le **concentrazioni annuali degli inquinanti atmosferici** di NO₂ mostrano un'ulteriore tendenza alla diminuzione; il rimbalzo nel 2021 non è così pronunciato come quello dei volumi di traffico, poiché anche altri effetti positivi giocano un ruolo - in particolare la quota crescente di veicoli EURO VI. Nel 2020, i valori medi annuali di NO₂ hanno superato il valore limite annuale dell'UE di 40 µg/m³ solo per la stazione di Bressanone sud/Brixen süd lungo il corridoio del Brennero. Si tratta di una differenza significativa rispetto al 2019, quando cinque stazioni hanno registrato valori superiori al limite annuale dell'UE. Per quanto riguarda il PM₁₀, i valori limite non sono stati superati in nessuna stazione e i **livelli di rumore** sono leggermente diminuiti a causa dei minori volumi di traffico.

Mentre i dati di monitoraggio si riferiscono al 2021 per quanto riguarda i volumi di traffico e gli indicatori ambientali, gli **indicatori di monitoraggio relativi ai prezzi** si riferiscono al 2022 e colgono già gli effetti della crisi ucraina. Con l'inizio della guerra in Ucraina nel febbraio 2022, i prezzi dei carburanti sono fortemente aumentati, nonostante le misure di stabilizzazione introdotte in vari paesi. Il prezzo medio del diesel è aumentato del 34% e quello della benzina del 23% (rispetto al 2021).

Migliori pratiche 2022 - Sfruttare tutte le opzioni

Le politiche di trasporto sono state ulteriormente sviluppate e ottimizzate in tutte le regioni iMONITRAF! per tutto il 2022. In Tirolo, le esenzioni per il trasporto regionale sono state gradualmente eliminate nell'ambito del divieto di circolazione settoriale e del divieto di circolazione per i mezzi pesanti ad alte emissioni e sono stati compiuti notevoli sforzi per migliorare i servizi di trasporto pubblico. Lungo il Brennero sono entrati in funzione altri centri di controllo per l'applicazione degli

standard del trasporto stradale. Inoltre, nel 2022 sono stati ulteriormente sviluppati progetti infrastrutturali sia per il trasporto merci che per quello passeggeri, con importanti tappe per il tunnel di base del Brennero e l'apertura di diversi centri di mobilità nelle regioni iMONITRAF! che supportano un trasporto multimodale di alta qualità per i passeggeri. Il miglioramento della mobilità transfrontaliera è stato oggetto di particolare attenzione in molte misure della raccolta delle migliori pratiche di quest'anno, in particolare le soluzioni di bigliettazione e i servizi per i pendolari transfrontalieri sono stati ulteriormente migliorati nel 2022. Guardando agli approcci innovativi per sostenere la decarbonizzazione del trasporto merci, il Canton Uri evidenzia come i contratti di appalto pubblico possano essere collegati a criteri di sostenibilità più ambiziosi per i servizi di trasporto, fornendo così nuovi incentivi. Nelle regioni italiane vengono inoltre testate e sostenute diverse soluzioni digitali per una migliore gestione delle fasce orarie e per il controllo dei volumi di traffico sull'asse del Brennero.



L'année 2022 d'iMONITRAF en un coup d'oeil

iMONITRAF! - Seules des politiques coordonnées peuvent relever le défi de la mobilité

Le rebond des volumes de trafic après les premiers effets de la pandémie COVID-19 a mis en évidence la nécessité d'une coopération plus forte des régions alpines pour relever leur défi commun du transport transalpin de marchandises. Les volumes de trafic sont revenus aux niveaux de 2019 et, avec eux, la pression pour développer des solutions efficaces et conjointes afin de mettre en place des incitations plus fortes pour le report modal et de s'assurer que les régions alpines puissent devenir un modèle pour la décarbonisation du transport routier de marchandises. Depuis 2005, iMONITRAF! est devenu une plateforme de connaissances sur le transport transalpin, basé sur un solide ensemble de données fournies dans le cadre du système de surveillance commun. Mais au-delà de cela, iMONITRAF! a également une voix politique forte en rassemblant les décideurs politiques pour discuter des défis et des solutions pertinentes et en utilisant la voix commune pour pousser des initiatives politiques conjointes au niveau national et européen.

Un ensemble net d'indicateurs cibles pour encadrer le parcours politique

Tout au long de la phase de coopération 2021-2022, les partenaires d'iMONITRAF! ont développé une nouvelle base stratégique pour mettre en œuvre le scénario combiné qui rassemble les impacts positifs du report modal, du changement technologique et qui est devenu la principale justification d'iMONITRAF! Dans un premier temps, iMONITRAF! a élaboré un plan d'action en 2021 et en a discuté avec les décideurs aux niveaux national et européen. Toutefois, cette voie d'action n'incluait pas d'objectifs ou d'indicateurs spécifiques permettant de définir une direction claire vers le résultat final escompté. Cette lacune a été comblée en 2022 et l'une des principales activités du réseau a consisté à élaborer une nouvelle série d'indicateurs cibles - sur la base des stratégies politiques, des scénarios ou des objectifs existants élaborés au niveau des régions et des corridors. Ces indicateurs cibles aideront le réseau à mieux communiquer sur le succès des mesures prises jusqu'à présent, mais aussi à mettre en évidence les besoins d'action supplémentaires. Le nouvel ensemble comprend des indicateurs cibles et des trajectoires cibles pour la répartition modale, les volumes de trafic ainsi que la part des poids lourds non diesel. Les progrès réalisés pour atteindre les indicateurs cibles seront désormais mis en évidence chaque année dans le cadre des rapports annuels.

Une dynamique positive au niveau européen pour renforcer le report modal

La nécessité de renforcer le report modal de la route vers le rail est une pierre angulaire du paquet européen "Fit-for-55" qui met en œuvre le Green Deal de l'UE ainsi que la stratégie de mobilité durable et intelligente. Tout au long de l'année 2022, plusieurs initiatives politiques ont été lancées afin d'améliorer et de rationaliser les mécanismes d'incitation au niveau de l'UE pour décarboner le secteur des transports. Les orientations RTE-T, qui constituent un cadre essentiel pour le développement et le financement du réseau transeuropéen de transport, ont un effet de levier considérable lorsqu'il s'agit de fournir des infrastructures ferroviaires de haute qualité le long des corridors transalpins. La nécessité de renforcer l'ambition de report modal du RTE-T et d'accélérer sa mise en œuvre a été reconnue par le Parlement européen qui a "amélioré" la proposition initiale de la Commission européenne pour la révision des orientations du RTE-T. iMONITRAF! a été en contact étroit avec les décideurs au niveau de l'UE pour s'assurer que les besoins spécifiques des Alpes soient pris en compte dans le processus de révision.

Plusieurs initiatives politiques très importantes pour iMONITRAF! ont également été mises en œuvre en 2022 dans le cadre du paquet "Fit-for-55". Il s'agit notamment des nouvelles normes d'émission de CO₂ pour les voitures et les camionnettes, de la révision de la directive sur les

infrastructures de carburants alternatifs et surtout du nouveau système européen d'échange de quotas d'émission pour les transports et les bâtiments qui met en œuvre, pour la première fois, un prix du CO2 à l'échelle européenne pour le secteur des transports. La directive sur le transport combiné et la directive sur la taxation de l'énergie ont également de nombreuses interfaces avec iMONITRAF! mais n'ont pas été mises en œuvre en 2022.

Mise à jour du suivi pour l'année 2021 - observation d'un rebond après les impacts du COVID-19

Après la réduction des volumes de poids lourds en 2020 due à la pandémie de COVID, un rebond quasiment au niveau pré-pandémique a été observé en 2021. Environ **23 700 véhicules lourds par jour (VL/jour)** ont traversé les sept principaux corridors transalpins, soit seulement 0,3 % de moins qu'en 2019. Si l'on considère le trafic quotidien moyen annuel des véhicules légers, les effets de la pandémie étaient encore visibles, ce qui s'explique par les restrictions de circulation toujours en vigueur en 2021. Au total, **64 400 véhicules légers par jour (VL/jour)** ont traversé les corridors alpins, soit une réduction de 21,3% par rapport à 2019, mais déjà un rebond très significatif de 26,9% par rapport aux niveaux inférieurs de 2020. L'analyse des données mensuelles met en évidence les effets des restrictions de mobilité mises en œuvre par les régions alpines concernées et montre que la réduction des volumes de trafic routier subie par les véhicules lourds en 2020 et 2021 est moins évidente que celle qui touche les véhicules légers.

Les **marchandises transportées** sur les corridors iMONITRAF ! représentent un total d'environ 165,9 millions de tonnes, dont 109,5 millions de tonnes par route (66%) et 56,4 millions de tonnes par rail (34%). La quantité totale enregistrée en 2021 est de 11% supérieure à celle de 2020 (première année de pandémie) et même de 4% supérieure à celle de 2019 (dernière année avant la pandémie). Le **répartition modale route-rail** a légèrement changé, avec +1% en faveur du rail. Malgré la pandémie de COVID, la répartition modale sur le corridor du Gothard a pu être encore améliorée à 68% grâce au corridor 4m désormais pleinement opérationnel. Le corridor du Simplon présente toujours la part modale la plus élevée pour le rail, soit 90%, tous les autres corridors étant nettement plus bas : 31% au Tauern (en baisse constante ces dernières années), 27% au Brenner, 18% à Fréjus/Mt. Cenis et 3% à Vintimille.

Les **concentrations annuelles de polluants atmosphériques** de NO2 continuent de diminuer, le rebond en 2021 n'est pas aussi prononcé que celui des volumes de trafic, car d'autres effets positifs jouent également un rôle, notamment la part croissante des véhicules EURO VI. En 2020, les valeurs moyennes annuelles de NO2 ont dépassé la valeur limite annuelle de l'UE de 40 µg/m3 uniquement pour la station de Bressanone sud/Brixen süd le long du corridor du Brenner. Il s'agit d'une différence significative par rapport à 2019, où cinq stations ont enregistré des valeurs supérieures à la limite annuelle de l'UE. Pour les PM10, les valeurs limites n'ont été dépassées dans aucune des stations et les **niveaux de bruit** ont légèrement diminué en raison de la baisse des volumes de trafic.

Alors que les données de surveillance portent sur 2021 en ce qui concerne les volumes de trafic et les indicateurs environnementaux, **les indicateurs de suivi liés aux prix** portent sur 2022 et captent déjà les effets de la crise ukrainienne. Depuis le début de la guerre en Ukraine en février 2022, les prix des carburants ont fortement augmenté, malgré les mesures de stabilisation introduites dans différents pays. Le prix moyen du diesel a augmenté de 34 % et celui de l'essence 95 de 23 % (par rapport à 2021).

Meilleures pratiques 2022 - Exploiter toutes les options

Les cadres de la politique des transports ont été développés et optimisés dans toutes les régions iMONITRAF! tout au long de 2022. Au Tyrol, les exemptions pour le transport régional ont été progressivement supprimées dans le cadre de l'interdiction sectorielle de circuler et de l'interdiction des poids lourds à fortes émissions, et des efforts importants ont été déployés pour améliorer les services de transport public. Le long du Brenner, des centres de contrôle supplémentaires pour l'application des normes de transport routier ont été mis en service. De plus, les projets d'infrastructure pour le transport de marchandises et de passagers ont été développés en 2022 avec des étapes importantes pour le tunnel de base du Brenner et l'ouverture de plusieurs centres de mobilité dans les régions iMONITRAF! qui soutiennent un transport multimodal de passagers de haute qualité. L'amélioration de la mobilité transfrontalière a fait l'objet d'une attention particulière dans de nombreuses initiatives de collecte des meilleures pratiques de l'année écoulée, notamment les solutions et services de billetterie pour les navetteurs transfrontaliers, qui ont encore été améliorés en 2022. En ce qui concerne les approches innovantes pour soutenir la décarbonisation du transport de marchandises, le canton d'Uri montre comment les marchés publics peuvent être liés à des critères de durabilité plus ambitieux pour les services de transport et fournir ainsi de nouvelles incitations. Dans les régions italiennes, plusieurs solutions numériques sont également testées et soutenues afin d'assurer une meilleure gestion des créneaux horaires et du pilotage des volumes de trafic sur l'axe du Brenner.



1 Background and objectives

iMONITRAF! network – The common voice of the Alpine regions

Transport volumes on the major Alpine transit corridors are projected to further increase in the coming years and the Alpine regions are challenged to find effective solutions for limiting environmental and social impacts. Since 2005, the Alpine regions have developed iMONITRAF! as joint platform on transalpine transport topics to develop coordinated and joint solutions. iMONITRAF! builds on the experience that individual policies at regional level have shown limited success in reducing the negative impacts of transalpine traffic and that better coordination and harmonisation along and between the major transit corridors is indispensable for developing future-proof solutions. iMONITRAF! has become a central knowledge-hub on transalpine transport, based on a strong data pool which is provided in the frame of the common monitoring system. But beyond that, iMONITRAF! has also a strong political voice by bringing together political decision makers to discuss relevant challenges and solutions and by using the common voice for pushing joint policy initiatives at national and European level.

The iMONITRAF! Strategic Approach

Already in 2012, iMONITRAF! recognized the need to develop a common strategic approach as framework for the joint activities. The Transport Strategy 2012 was based on insights of the monitoring system and an evaluation of potential instruments and included a common target system as well as a set of policy instruments. To illustrate the potential effects of these instruments on traffic volumes and the environment up to 2020, a simple evaluation scheme based on the DPSIR approach was developed in 2012 to serve as decision making aid to the transport strategy. This DPSIR evaluation of different “policy scenarios” was updated in 2020 to provide insights for the timeframe up to 2030. The new scenarios 2030 included a Reference Scenario, a Modal shift Scenario with ambitious modal shift measures, an Innovative technologies Scenario focusing on road transport and a Combined Scenario which integrates the positive aspects of both scenarios. The Combined Scenario illustrates that an effective improvement of the DPSIR indicators is only possible with a reduction of overall HGV transport volumes, confirming the existing strategy and measures of iMONITRAF!.

Based on the rationale of the Combined Scenario, iMONITRAF! partners then developed a policy pathway to improve modal split and the technical performance of vehicles at the same time. This pathway can be seen as strategic orientation for further activities – also including activities at EU and national level to ensure that needs of the Alpine regions are recognized in upcoming political discussions.

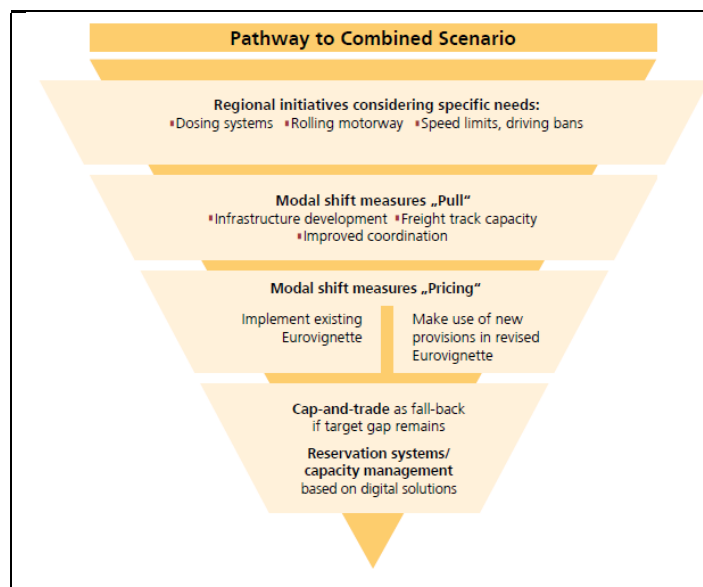


Figure 1: The core of the iMONITRAF! policy pathway

Objectives 2022 – A new set of target indicators and strengthened networking

Up to now, the policy pathway as illustrated above did not include any specific targets or target indicators to set a clear direction for the final desired outcome. This shortcoming was tackled in 2022 and one major activity of the network was to develop a new set of target indicators. These target indicators shall support the network in better communicating the success of measures taken so far but also in highlighting additional need for action.

The common voice of iMONITRAF! also had a high demand in 2022, with many important political discussions at national and European level – for example regarding the further development of the TEN-T network, frameworks related to crucial policy instruments but also decisions on future strategic approaches for financing rail infrastructures and services. With the Simplon Alliance, a special opportunity for highlighting the needs of the Alpine regions at national level was provided and iMONITRAF! partnered up with the developers of the Simplon Action Plan to ensure that iMONITRAF! knowledge and solutions find their way into the Action Plan. The Simplon Action Plan can be seen as step at national level to closer align transport and environmental agendas in the Alps and to integrate the activities of the Follow-up Zurich process into the Alpine Convention.

Activities related to monitoring

As in the previous year, a special focus in the monitoring activities was given to the effects and impacts of the COVID-19 pandemic. Lock-downs and travel restrictions also played a role in the monitoring year 2021, but some rebound effects to the pre-pandemic situation were already visible. The review of monthly data for traffic volumes and environmental data provides some additional insights on the sensitivity of environmental data with respect to changes in road traffic volumes but also on the diverging short-term and medium-term effects of the pandemic.

Annual Report 2022 – overview on main iMONITRAF! activities

The Annual Report 2022 provides an overview on iMONITRAF! activities as well as on recent developments in the Alpine regions, at national as well as at European level. Its target groups are policy makers at the different political levels as well as the broader network acting on transalpine transport policy.

The report includes the main activities of the year 2022. It starts out with an illustration of the new set of target indicators and its discussion during the political roundtable in Innsbruck in December 2022 (chapter 2). An overview on developments at EU level with a special focus on elements of the Fit-4-55 package and the revision of the TEN-T regulation are the focus of chapter 3. Chapter 4 presents networking activities with EUSALP AG4 and other relevant Alpine-wide institutions, initiatives and projects. In chapter 5, an update of monitoring results is presented, including an interpretation of monthly data for some selected indicators to better interpret the impacts of the COVID-19 pandemic. Chapter 6 presents the update of Best Practice, including information on all iMONITRAF! policy pillars. Finally, the report includes an outlook on the following two years.

2 A new set of target indicators for iMONITRAF!

2.1 Understanding the new set of target indicators

Following the publication of the iMONITRAF! Policy Scenarios 2030, iMONITRAF! partners have developed a new policy pathway to reach the Combined Scenario. Taking into consideration existing regional targets and the available toolbox, this pathway is understood to be a strategic orientation for further activities - also including activities at EU and national level. As starting point, the pathway defines some common rationales and principles that were agreed by iMONITRAF! partners and which are closely linked to the principles laid down in the iMONITRAF! strategy of 2012. But, up to now, the pathway did not include any specific targets or target indicators.

To strengthen the role of the policy pathway and to better evaluate the implementation progress, iMONITRAF! partners decided to launch a discussion on a new target system in 2022. The discussions soon highlighted the difficulty of defining common transport-related targets. All the regions have their own strategic approaches and have defined targets at regional level – these have different rationales and legal backgrounds and are difficult to complement or even to be replaced by targets defined at the level of iMONITRAF!. It was thus agreed to rather develop a “set of target indicators” that work in the logic of the monitoring system rather than strategic targets defined at political level. Such a set of target indicators takes the following function:

- **Strengthen the fact-based approach:** Target indicators and target paths can be added to the specific monitoring data, so that each year it can be seen if developments are in-line with the target path or if they are insufficient.
- **Early-warning:** This results can be seen as “early-warning”. If developments are not in line with the target path, joint efforts need to be improved. This is also in line with the policy pathway which includes common cap-and-trade approaches as fallback if a “target gap” remains.
- **Strengthen the common voice:** As target indicators are developed in a joint approach and as the same target indicators are implemented for all corridors, this strengthens the common approach and the common voice with respect to the national and European level.

2.2 Definition of the new target indicators¹

2.2.1 Transport-related target indicators: Modal split

Modal shift is the leading rationale of iMONITRAF! and is at the heart the backbone of the Combined Scenario. Modal split road-rail is also already an indicator within the iMONITRAF! monitoring system (see chapter 5).

Approach: modal split target indicator and target path

To ensure that the set of target indicators can be used for political communication, modal split target indicators need to be in line with existing political strategies, scenarios or targets at regional and corridor level.

- For the Brenner corridor, the new [scenarios provided by the Brenner Corridor Platform \(BCP\)](#) offer the most recent basis with information on projected transport volumes and

¹ For the time being: Quantitative indicators are defined for the Brenner and the Swiss corridors.

modal split. These scenarios were developed in a joint effort by all partners along the Brenner corridor, including the national ministries, and are recognized as common reference.

- For the Swiss corridors (Gotthard and St. Bernardino combined), a modal split target is not defined at political level – since the HGV target as defined in the Swiss Constitution provides the leading rationale. Still, a modal split target indicator provides additional information and can be calculated on the basis of recent scenarios developed at national level in Switzerland. The project “[Perspektive Bahn 2050](#)” provides the most recent basis, it provides the relevant data for 2030 and 2040.

Definition of modal split target indicators

Based on the reference year 2019, the following modal split target indicators and target paths can be derived for the Brenner and Gotthard corridors:

MODAL SPLIT TARGET INDICATORS – DEFINITION

	Modal split rail		Increase modal split (percentage points)		Pathway annual increase (percentage points)	
	Brenner	CH corridors	Brenner	CH corridors	Brenner	CH corridors
2019 monitoring data	26%	71%				
Reference Scenarios 2030 <i>Target & target path 2019-2030</i>	36%	83,7%	+9.8%P	+12.4%P	+0.9%P	+1.1%P
Reference Scenarios 2040 <i>Target & target path 2030-2040</i>	50%	84.2%	+14.4%P	+0.5%P	+1.4%P	+0.1%P

Table 1: Modal split target indicators: 2019 data, relevant reference scenarios and target paths

For the Brenner, the path leads from the current modal split (2019 data) of 26% to the target of a 50% share of rail transport in 2040, assuming that the Brenner Base Tunnel (BBT) and its access tracks are in full operation at this point in time. As intermediate target, a modal split of 36% shall be reached by 2030. This implies a target path of +0.9 percentage points (%P) between 2019 and 2030 and then +1.5%P between 2030 and 2040.

For the Swiss corridors, the development path starts on higher level, with a 71% modal split of rail already in 2019. Until 2030 a modal split of 83.7% is envisaged. After that, the additional potential is very limited. This implies a target path of +1.1%P between 2019 and 2030.

Comparing these modal split targets and the resulting target paths, it can be stated that the two considered corridors start from very different levels of modal split but have a similar ambition towards the target path: in the next ten years, the new scenarios assume an increase of the modal split of rail by +10-12%P until 2030. For both corridors, this relates to a target path 2019-2030 with an annual increase of modal split of roughly 1%P per year. After 2030, additional modal split achievements vary more strongly: the Brenner takes a stronger dynamic after the Brenner Base Tunnel is in place; for the Swiss corridors only limited additional potential remains, since the base tunnels (Gotthard, Lötschberg) already exist.

2.2.2 Transport-related target indicators: HGV volumes

The number of HGV that cross the Alps every year are an indicator that is easy to communicate and that is striking in its clear message. A common set of HGV targets does currently not seem feasible, but a target indicator is seen as good compromise to raise awareness.

Approach: HGV target indicator and target path

Again, it seems necessary to define HGV target indicators which can find political support. Even if they are not officially agreed at political level, they need to be in line with existing political strategies, scenarios or targets to be integrated in the iMONITRAF! monitoring system and to become an effective part of future iMONITRAF! communication activities.

- For this indicator, it is the other way round: for Switzerland an official target is available with the target of 650.000 alpine crossing HGV as laid down in the Swiss Constitution.
- For the Brenner, the new BCP scenarios also provide an information on traffic volumes on the road. The central case scenario assumes that rail capacities increase considerably and that transport volumes on the road (in tons) grow only very slightly between 2016 and 2030 (+0.3%). Considering 2019 as base year, this would be equal to a stabilization of traffic volumes on the road (in tons). This leaves some room for flexibility to identify HGV volumes through varying slightly the load factors: the BCP scenarios assume an average load factor for 2030 on the Brenner of 16.0 t/HGV (including empty runs, regional transport, etc.). This assumption is very close to the current load factor (14.8 t/HGV in 2020), so that an additional efficiency increase could be assumed – especially if the policy measures that are integrated in the BCP scenario with additional internationalization measures and subsidies come into force.

Definition of HGV target indicator

An overview for the HGV target indicator is summarized in the table below.

HGV TARGET INDICATORS – DEFINITION

	HGV volume in Mio vehicles/year		Reduction overall (in %)		Pathway annual reduction (in %)	
	Brenner	CH corridors	Brenner	CH corridors	Brenner	CH corridors
2019 monitoring data	2.69	1.01				
Reference Scenarios 2030 or political target	2.05	0.65				
<i>Target & target path 2019-2030</i>			-24%	-35%	-2.2%	-3.2%

Table 2: HGV target indicators: 2019 data, relevant reference scenarios/political targets and target paths

For the Brenner, an efficiency increase of 15% is assumed (average load factor of 18.4 tons/HGV instead of 16 tons /HGV as considered in the BCP central case scenario)

Considering these targets for the Brenner and the Swiss corridors, additional efforts can nicely be communicated. For the Brenner, it can be said that the target of 2 Mio. HGV/year is not a very ambitious target but rather a stabilization target when looking at transported tons on the road. It is only realistic to assume some efficiency improvements in the sector up to 2030 and to argue

that a stabilization of transport volume will lead to a slight reduction in vehicles. Considering that HGV volumes already exceeded the number of 2.6 Mio. HGV in the years 2019 and 2020, this target of 2.0 HGV/year can however be communicated as an effort.

On the Swiss corridors, transport volumes exceeded the number of 1 Mio. HGV on the Gotthard and San Bernardino: in 2019, about 1 Mio. HGV still crossed the corridors via the Gotthard and San Bernardino tunnels (measuring stations in the tunnels). Reaching the target of 650.000 HGV is also quite ambitious and needs additional efforts.

2.2.3 Climate-related targets indicators: share of non-Diesel HGV

The Combined Scenario follows the rationale of the 'Avoid-Shift-Improve' approach: transport volumes that cannot be transferred to rail should be transported through the Alps in the cleanest vehicles. The policy pathway thus implements the toprunner approach: vehicles with clean technologies should be used for transalpine freight transport as priority to consider the over-proportional environmental burden in the mountain environment.

Approach: climate-related target indicator with non-Diesel share

At EU level, the new Sustainable and Smart Mobility Strategy sets the target that the freight transport fleet should be fully decarbonized up to 2050. For 2030, it states that 80.000 zero-emission lorries should be available.² The Alpine Climate Target System also calls for a decarbonized transport fleet up to 2050. For the transalpine corridors these targets could be further specified to implement the model-region and toprunner approach. However, the development paths of different technologies are currently difficult to forecast: full electric vehicles for the long-distance segment are just entering the market, LNG/CNG are available but their price competitiveness seems questionable with increasing gas prices as currently seen due to the war in the Ukraine and the development of green hydrogen also depends on several factors that are yet difficult to estimate. Also, the different Alpine countries have taken slightly different policies to support alternative technologies for freight transport.

It was thus agreed to define a target related to the share of non-Diesel HGV. This would imply that a given share of vehicles would run on new technologies, but without prioritizing a specific technology.

Definition of non-Diesel target indicator

For the iMONITRAF! Policy Scenarios 2030, technological progress was defined in the frame of the Technology Scenario. This progress is also assumed in the Combined Scenario. This assumption refers to a **reduced share of Diesel-HGV of 36% up to 2030**.

- This share is used as intermediate target indicator for non-Diesel HGV.
- Further targets for 2035 and 2040 can be added later on.

² For comparison: Scania as one of the largest HGV producers has produced about 90.000 HGV in 2020 and similar numbers in the year before. Scania has announced in January 2021 that half of its truck sales would be zero-emission in 2030. So this number of 80.000 zero-emission HGV does not seem too ambitious compared to the potential. However in 2020, the annual electric truck sales barely reached 400 units.
<https://www.transportenvironment.org/discover/the-year-we-joined-manufacturers-to-make-zero-emission-trucks-a-reality/>

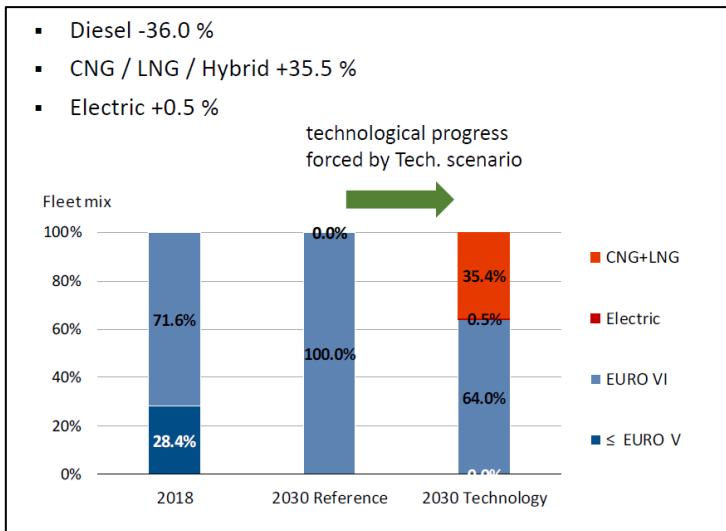


Figure 2: Assumptions in the Technology Scenario of the iMONITRAF! Policy Scenarios 2030

Looking at the EU and Alpine-wide targets that call for a full decarbonization of the freight transport fleet up to 2050 but provide no paths or intermediate targets until then, the target indicator of 36% non-Diesel HGV up to 2030 can become a helpful tool for the Alpine regions to monitor progress in the next couple of years.

The difficulty, at least in the short term, is the availability of relevant data for this target indicator: up to now, HGV are differentiated into Euro classes in the vehicle categories of the relevant pricing systems and new technologies are not systematically counted. This will however change in the next years with the new logic of the Eurovignette. As soon as HGV charges are differentiated into the new CO₂-emission classes, the data will be available. Up to now, it has to be seen if estimates are available for the iMONITRAF! corridors.

2.3 Current progress in reaching the target indicators

Thanks to the data collected every year by the iMONITRAF! partners, it is possible to integrate the modal split target indicators in the monitoring system, in order to analyse the data time series according to the expected goals for the years 2030 and 2040 respectively.

Progress in reaching the modal split target indicators

The following figure 3 displays the available modal split data for the Brenner and Swiss corridors (Gotthard, San Bernardino and Simplon) and put them in comparison with the rail modal split targets for 2030 and 2040.

Comparing the 2021 monitoring data with the target paths, it can be seen that developments both on the Brenner and the Swiss corridors are still on track towards reaching the 2030 target indicators. However, the improvements on the Brenner with respect to modal split still need to be accelerated – between 2020 and 2021 the modal split only increased by 0.7 percentage points which lies below the necessary annual increase. On the Swiss corridors, however, modal split was improved at a higher rate than necessary for the target path – thanks to the effects of the now fully operational 4m corridor.

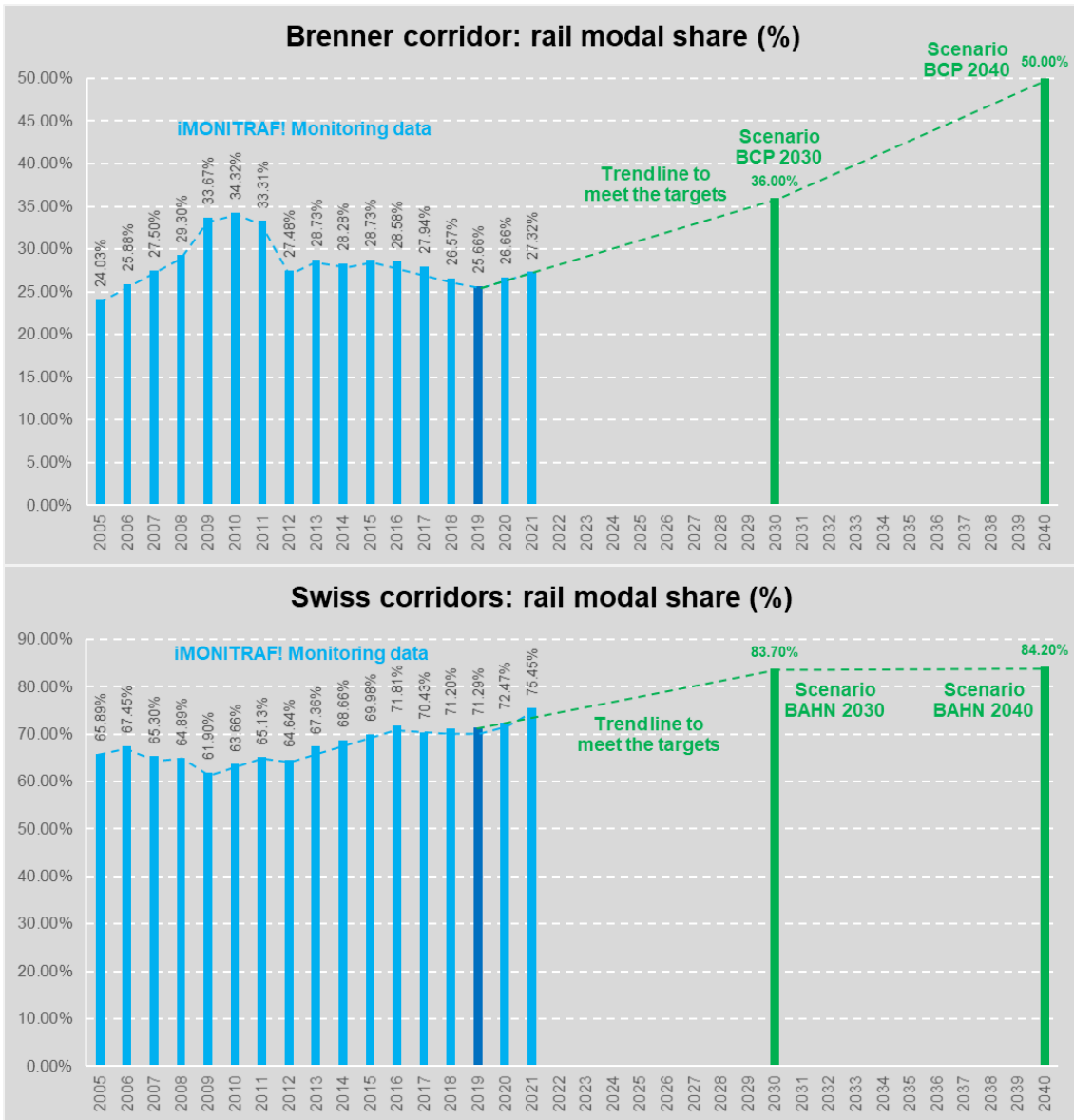


Figure 3: Modal split target indicator and target path for the Brenner and the Swiss corridors
 The graph shows in blue the monitoring data collected since 2005. In green there are the target indicators for the Brenner and Swiss corridors for 2030 and 2040. The blue trend line (dashed) shows the evolution of figures in the previous years and the green line indicates the target path that should be seen in the next years to reach the defined targets.

Progress in reaching the HGV target indicators

Similarly, Figure 4 below highlights the progress in reaching the HGV target indicators. When interpreting the figure, the special effects of the COVID-19 pandemic need to be considered which led to the visible “dip” in HGV volumes in 2020. But the figure also shows a rebound of traffic volumes – especially on the Brenner the volume in 2021 nearly went back to the 2019 numbers (for further information see the detailed explanations and monthly data in the monitoring chapter 5). On the Swiss corridors, the effect is less pronounced but still clearly visible. On both corridors, progress is still on the target path. But it needs to be clearly recognized that this is due to the effects of the pandemic and that traffic volumes will rise further if no additional measures will be taken.

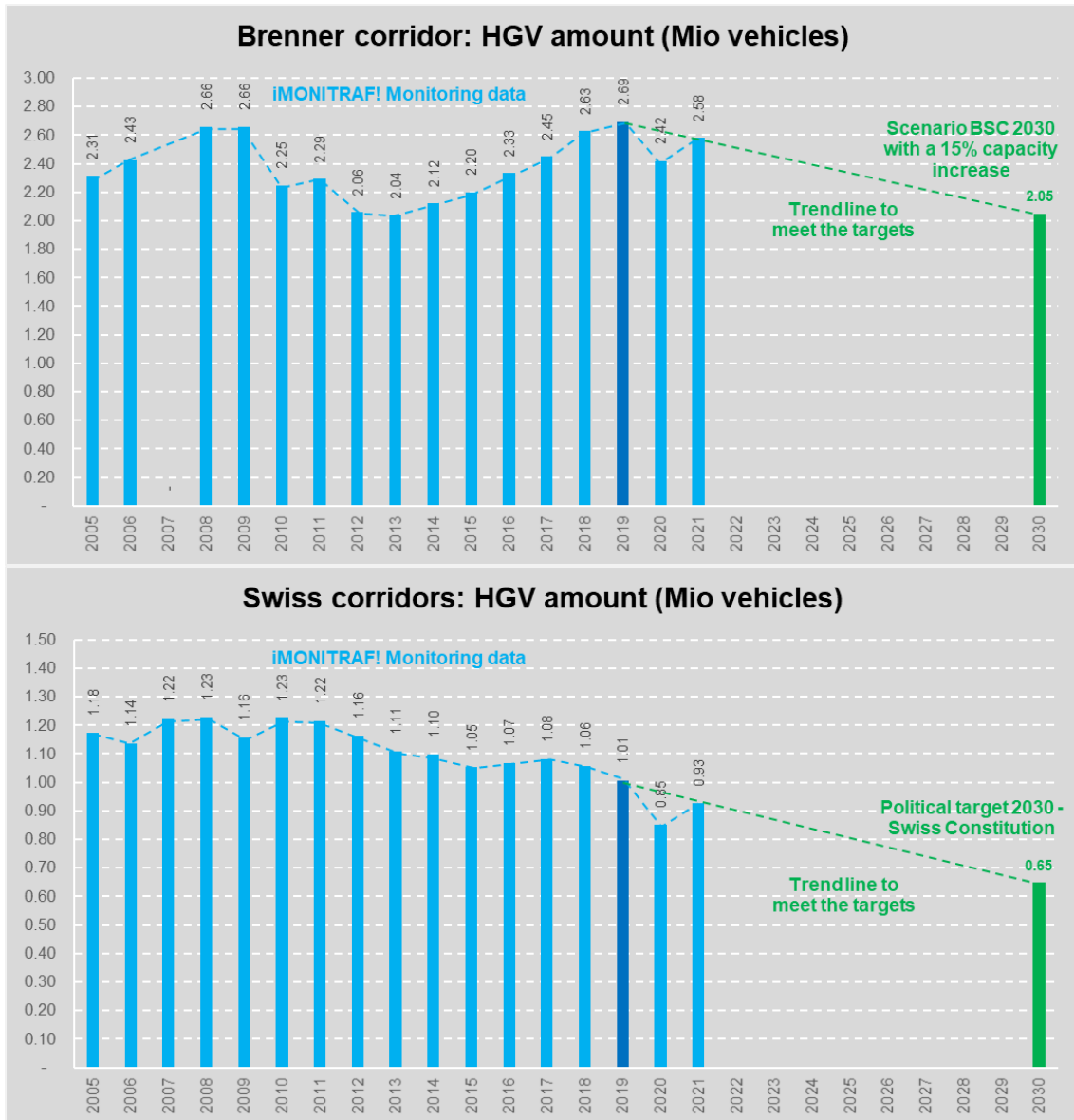


Figure 4: HG target indicator and target path for the Brenner and the Swiss corridors
 The graph shows in blue the monitoring data collected since 2005. In green there are the target indicators for the Brenner and Swiss corridors for 2030 and 2040. The blue trend line (dashed) shows the evolution of figures in the previous years and the green line indicates the target path that should be seen in the next years to reach the defined targets.

2.4 Political discussion on target indicators during Innsbruck roundtable

At the end of 2022, political representatives of all iMONITRAF! partner regions met for a hybrid political roundtable (Innsbruck and online) to discuss the role of the target indicator set as well as the underlying policy pathway for the upcoming cooperation period. It was agreed to continue the successful cooperation of iMONITRAF! for the period 2023-2025 and the roundtable provided a good opportunity to discuss “hot topics” in the different regions and to identify topics with high coordination need. Major results of the roundtable were:

- All political decision makers acknowledge the new target indicators and welcome the approach to link the target indicators closely to the monitoring system. The fact-based approach

is a great strength of iMONITRAF! and linking target indicators to this fact-based logic can reinforce the informative value of the common monitoring system.

- The importance of the data exchange was specifically highlighted by several participants. The monitoring system is one great strength of iMONITRAF! and should be further developed in the new cooperation phase. Especially, it would be interesting to receive more information on origin and destination of alpine crossing HGV and the role of regional transport. With a view to decarbonization, it would also be important to exchange data on alternative vehicle technologies and their use along the corridors.
- Joint efforts should also focus on improving combined transport infrastructure and rail productivity along the transit axis. Improved cooperation and harmonization along but also between the corridors is necessary to provide high-quality rail services. To extend the efforts on the overall corridors, iMONITRAF! also needs to use its strong common voice at European level to accelerate the implementation of the TEN-T network.
- The potential of digital solutions and their added value to promote green corridors should also be investigated in more detail in the new period. A smart application of digital solutions has considerable potential to improve efficiency both of road and rail transport.
- As traffic volumes are projected to further increase, political decision makers also highlighted their interest in investigating capacity management and steering instruments. The new proposal for a slot system as presented in South Tyrol (see chapter 6) could be the starting point.



Left: Participants of the lunch event – Live in Innsbruck and online
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Above: Regional Councillor for Mobility of Tyrol René Zumtobel, MEP Barbara Thaler, Regional Councillor of the Canton of Uri Dimitri Moretti (left to right)
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Figure 5: Discussion at political roundtable in Innsbruck

3 Trends for transport and environmental policies at EU level

At EU level, the year 2022 has seen major progress in implementing the “Fit-for-55” package and thus putting the EU on track to reach its ambitious climate goals as agreed in the European Green Deal in 2019, based on the European Climate Law in 2021. “Fit-for-55” refers to the intermediate EU target of reducing net greenhouse gas emissions by at least 55% by 2030 – ensuring that Europe can become the first climate-neutral continent by 2050.

The agreements within the “Fit-for-55” package of 2022 are based on the initial proposal of the European Commission from July 2021. Overall, the package strengthens eight existing pieces of legislation and presents five new initiatives, across a range of policy areas and economic sectors: climate, energy and fuels, transport, buildings, land use and forestry. For the transport sector, four legislative packages are especially relevant – they are presented in detail in this chapter.

In addition, several important dossiers which are not directly linked to the “Fit-for-55” package but which are crucial elements in reaching the overall objectives of the EU Green Deal and the EU Smart and Sustainable Mobility Strategy. The revision of the TEN-T Regulation as well as the Combined Transport Directive are highly relevant to iMONITRAF! in this respect.

EU Emissions Trading System for Transport and Buildings (EU ETS2)

In December 2022, the EU Council and Parliament reached a provisional deal for reforming and thus strengthening the EU emissions trading system (EU ETS). This agreement includes the creation of a new, separate emissions trading system for buildings, road transport, and other fuel-consuming sectors, in order to ensure cost-efficient emissions reductions in these sectors that have been difficult to decarbonise so far. The new system will apply to distributors that supply fuels to the buildings, road transport and certain other sectors. It thus follows an “upstream approach” and thus leads to the implementation of a CO₂-price for the road transport sector. The cap for this EU ETS 2 is defined in the following way: from 2027 onwards, the number of emission allowances should decrease linearly by 5.15% of the reference quantity annually and from 2028 onwards by 5.43%. The total reduction in 2030 should be 43% compared to 2005. The Council and Parliament agreed to auction an additional 30% of the auction volume for the first year of the launch of the system, so that it runs smoothly.

Regarding the sectors already included in the EU ETS (energy-intensive industries and power generation), EU Council and Parliament agreed to increase the overall ambition of emissions reductions by 2030 to 62%.

CO₂ emission standards for cars and vans

As central framework for decarbonising road transport (cars and vans), it was agreed to put new strengthened CO₂ emission reduction targets in place to deliver a strong signal to accelerate the uptake of zero-emission vehicles on the Union market and to stimulate innovation in zero-emission technologies in a cost-efficient way. In October 2022, the Council and Parliament reached a provisional agreement which, in practice, means **that from 2035 it will no longer be possible to put in traffic new cars or vans with an internal combustion engine on the market in the EU.**

Specifically the following targets were agreed:

- 55% CO₂ emission reduction target for new cars and 50% for new vans by 2030 compared to 2021 levels
- 100% CO₂ emission reduction target for both new cars and vans by 2035.

The existing incentive mechanism zero- and low-emission vehicles (ZLEV) will be maintained until 2030. As part of this mechanism, if a manufacturer meets certain benchmarks for the sales of zero- and low-emission vehicles it can be rewarded with less strict CO₂ targets. Also, the agreement includes a wording on CO₂ neutral fuels – however pending on a proposal of the EU Commission on how this can be put into practice to be in conformity with the EU's climate neutrality objective.

The Commission work programme 2022 also contained an initiative to review the Regulation for CO₂ standards for new heavy-duty vehicles in the EU and a public consultation was held in the first quarter of 2022. However, no further steps were yet taken with respect to this dossier.

Alternative fuels infrastructure (AFIR)

In June 2022, the Council adopted a general approach on the draft regulation on the deployment of alternative fuels infrastructure. The main objective is to ensure sufficient access to an infrastructure networking for recharging or refueling road vehicles or ships with alternative fuels as well as to make sure that interoperability throughout the EU is provided.

In particular, the following provisions are included in the general approach:

- Electric charging infrastructure for light-duty road vehicles (cars and vans): mandatory requirements in the regulation relate to the power to be provided by electric charging infrastructure, based on the size of the registered fleet (differentiated into full battery electric vehicles (BEV) and plug-in vehicles). Also distance-based targets are included along the TEN-T coverage in 2025 and 2030.
- Recharging electric heavy-duty vehicles: For HGV, requirements for electric charging stations also relate to distance-based targets on the TEN-T, starting in 2025 for electric heavy-duty vehicles: publicly accessible recharging pools dedicated to HDVs to be deployed in each direction of travel with a maximum distance of 60 km in between them on the TEN-T core network and 100 km on the TEN-T comprehensive network.
- Hydrogen refueling: hydrogen, publicly accessible hydrogen refueling stations (with a defined minimum capacity) should be deployed, with a maximum distance of 150 km in between them along the TEN-T core and the TEN-T comprehensive networks by the end of 2030, and at least one should be available in every urban node of the TEN-T network

To make electric recharging and hydrogen refuelling infrastructure easy to use, users' needs in terms of different payment and price-display options have been fully taken into account, while avoiding disproportionate investment, particularly in existing infrastructure.

Revision of the TEN-T Regulation to ensure that the TEN-T serves EU climate objectives

The Regulation for the development of the trans-European transport network (TEN-T Regulation) provide the legislative framework for national and EU investments in transport infrastructure and for targeted funding under the Connecting Europe Facility and other relevant EU schemes. The TEN-T Regulation also defines technical requirements and the take-up of innovative digital solutions to foster interoperability on the whole network. An evolving political and economic context, the decarbonisation objective and other environment-related challenges as set out in the European Green Deal necessitate changes in TEN-T policy and a revision process was launched already in the year 2020 with a public consultation. The European Commission has presented its proposal for the revision of the TEN-T guidelines at the end of 2021 and the European Parliament has then “upgraded” the already ambitious proposal of the Commission to strengthen the modal shift ambition of the TEN-T and to accelerate its implementation.

The amended proposal of the EU Parliament recognizes that a completed and effective TEN-T is essential to reach the transport targets of the EU Green Deal. With the right policies and rail as a backbone, the implementation of TEN-T can support an increase in rail freight by 50% by 2030 and a doubling by 2050. Several key elements of the current proposal are specifically important to strengthen modal shift on the TEN-T and iMONITRAF! will use its networking opportunities at EU and national level to ensure that they remain part of the final agreement:

- **Requirements for freight transport on the rail network:** To support modal shift from road to rail, standards and requirements on the rail network need to be scaled up as foreseen in the current proposal: this includes a minimum provision for tracks for freight trains, a standardisation of infrastructures to allow long freight trains (740m) with a P/C 400 loading gauge and minimum speed requirements.
- **Requirements for border-crossings:** Especially in the Alps, several border crossings are part of the major corridors. Currently, freight trains lose up to one hour at every border for the administrative procedures. iMONITRAF! thus welcomes the ambition to regulate the maximum waiting time at borders to 15 minutes (dwelling time).
- **Efficiency improvements through ERTMS:** A boost in the deployment of ERTMS has considerable potential to increase efficiency on the overall rail freight network.
- **Accelerated development of terminal infrastructures:** overall, modal shift requires a higher density and capacity of intermodal transshipment terminals. Especially, additional terminals are necessary to better connect the TEN-T network to urban nodes and to provide improved last-mile solutions.
- **Infringement processes:** the revision process needs to strengthen the commitment for the timely finalisation of the TEN-T core network. This shall be achieved by a change in the governance framework: turning the working plans of the TEN-T coordinators into implementing acts with yearly reporting enables a better monitoring of progress and an easier launch of infringement procedures if works on the TEN-T infrastructures are delayed.

Combined Transport Directive and Energy Taxation Directive

The Combined Transport Directive sets the framework for CT services and regulates financial support for CT. Its specific design is crucial to ensure that rail plays a central role in combined transport solutions, it is thus highly relevant for iMONITRAF!. Also, the Energy Taxation Directive is an important dossier for the Alpine region as it sets the framework for taxing fossil fuels with the objective to stronger harmonize tax levels and structures. For both dossiers, first assessments were made available but no further steps were taken in 2022. iMONITRAF! will monitor the progress in the coming year.

4 Synergies with EUSALP and other networking activities

Synergies with EUSALP AG4

Similarly to iMONITRAF!, the EUSALP Action Group 4 Mobility (AG4) had an intensive cooperation in 2022 with the re-start of face-to-face meetings and the transition to a new work plan. Members of the Action Group strategically discussed the role of different topics for the further cooperation and the options of AG4 to become a stronger voice at European level. For iMONITRAF!, the following activities of EUSALP AG4 provided direct interfaces and synergies:

- The **EUSALP Declaration on Rail** was finalised and was presented and published at the 5th EUSALP Mobility Conference in Innsbruck in May 2022. The Declaration calls on the European Union to create a level-playing field between transport modes as basic requirement for an effective modal shift, to optimise the potential of rail to serve as the backbone of a connected transport system and to improve infrastructure provisions for rail transport. 15 Alpine regions officially declared their support by means of a Letter of Support. To follow-up on the Declaration on Rail, the Governors of Tyrol and South Tyrol and the Minister for Europe of Bavaria sent a joint letter to Ursula von der Leyen and the national transport ministers of Germany, Austria and Italy calling for a corridor toll along the Brenner route and for accelerating the upgrading of railway infrastructure.
- Considering the recent energy crisis and the growing pressures to improve energy efficiency in the transport sector, AG4 launched a **new activity on “Energy transition in the transport sector”**. During a working session in October, AG4 members started to develop a map on Alpine-specific solutions for energy efficiency in the transport and mobility system, on stakeholders that are needed for their implementation as well as policies, incentives and support measures to boost their roll-out. Follow-up activities are foreseen in the new Work Plan 2023-2025.
- AG4 also continued the project labelling and finetuned the relevant assessment methodology throughout 2022. In total, 20 projects have by now received the EUSALP-label. They all have a strong relevance for fostering sustainable mobility solutions in the Alpine Region from a macroregional perspective.
- The European Region Tyrol-South Tyrol-Trentino and Région Sud Provence-Alpes-Côte d’Azur re-confirmed their co-leadership role of AG4 for the upcoming mandate 2023-25 which will ensure continuous flow of information and synergies with iMONITRAF!.

Simplon Alliance

An important window-of-opportunity for iMONITRAF! in 2022 was the initiative of the joint Swiss Presidency of the Alpine Convention and the Follow-up Zurich Process to bring together environmental and transport ministers to launch an action plan for decarbonizing the transport sector in the Alps. This initiative is called the “Simplon Alliance”, referring to the location of the XVII. Alpine Conference which took place in Brig in October 2022.

To launch the process, a first meeting of transport and environmental ministers took place in a virtual format in January 2022 to discuss major topics and elements for a potential action plan. A draft action plan was then developed by the team of the Swiss Presidency and shared with relevant stakeholders for a feedback round in May. iMONITRAF! could contribute considerably in finetuning the chapter on freight transport of this draft action plan as all proposed topics/measures being also part of the iMONITRAF! policy pathway. In general, the Simplon Action Plan provided a great opportunity to streamline the work of iMONITRAF! with ongoing activities at the level of

the Alpine Convention and the Follow-up Zurich process and to obtain a stronger commitment by national-level decision makers.

The Action Plan "[Towards net-zero emissions in the transport sector in the Alps by 2050 at the latest](#)" was signed by the participating ministers during the Alpine Conference in Brig on 26th October and next steps towards its implementation are now launched. iMONITRAF! has already stated its interest in its implementation.

Alpine Climate Board, ACB Transport Community and further networking

iMONITRAF! has further closely cooperated with the Transport Community of the Alpine Climate Board, especially with respect to sharing information and knowhow and the objective to coordinate political lobbying activities at EU level. Several webinars have been organized in 2022, relating to the Combined Transport Directive, the new EU Emissions Trading System for Transport & Buildings as well as the TEN-T Regulation. Results of these webinars became the basis for developing joint political statements on the Combined Transport Directive and the TEN-T Regulation that can be used by iMONITRAF! and other stakeholders for a stronger Alpine voice in EU decision making processes.

iMONITRAF! closely cooperated with other institutions and stakeholders in the field of transalpine freight transport. The Lead Partner of iMONITRAF! also represents the network during the meetings of the Alpine Convention's Working Group Transport.



5 Monitoring of iMONITRAF indicators

As monitoring data for a full calendar year is only published by the different sources throughout the following year, the monitoring data presented in the iMONITRAF! Annual Reports always focuses on the previous year. The Annual Report 2022 thus presents monitoring data for 2021 regarding indicators related to the road traffic volumes, the transported tons and modal split, the concentration of nitrogen dioxide and particulate matter and the exposure to noise.

To follow up on the impacts of the COVID-19 pandemic in 2021, the monitoring chapter includes monthly-level data (for the years 2019, 2020 and 2021), which allow a better understanding of the implications of the pandemic crisis. Monthly data regard (a) the road traffic volumes, (b) the trans-alpine freight transport (rail and road), and (c) the air pollution concentrations measured. Additionally, considerations about the impacts of the COVID-19 pandemic are included in the description of all the other indicators when relevant.

All data reported in this report are available also in the **iMONITRAF! WebGIS application**³. It allows visualising and analysing the data contained in this report, as well as all data collected in the iMONITRAF! framework in the last 20 years.

5.1 Evaluation of monitoring results

This chapter provides the main findings from the data analysis of the iMONITRAF indicators, which include road traffic volumes, the transported tons and modal split, the concentration of nitrogen dioxide and particulate matter, the exposure to noise, toll prices, prices of fuel, recharging stations with alternative fuels, and national pricing components for road transport. For all the indicators, some methodological choices have been made both for the collection, analysis and interpretation of data. This chapter focuses on the description of the monitoring results, while chapter 5.2 provides all the relevant methodological explanations for each indicator.

To identify the eight transalpine corridors object of the analysis, a consistent colour scale is adopted: **yellow** = Ventimiglia, **orange** = Fréjus/Mont Cenis, **red** = Mont Blanc, **blue** = Gotthard, **light blue** = San Bernardino, **cyan** = Simplon, **green** = Brenner, **violet** = Tarvisio/Tauern.

Indicator “Road traffic volumes” – Annual data

(1) Figure 66 analyses the **overall annual average daily traffic for all vehicles** in the years 2005-2021. This indicator is the sum of total light and heavy vehicles circulating along the different corridors, divided by 365 (366 in leap years). In 2021, the number of vehicles crossing all iMONITRAF! corridors is about 88,148 per day (with an increase by 22.9% compared to the first pandemic year 2020, but however 16.5% lower than the pre-COVID-19 data registered in 2019).

With an average of 24,629 vehicles per day, the Brenner corridor presents the highest traffic flows, followed by Ventimiglia and Gotthard (19,416 and 16,969 vehicles). Tarvisio lies in the middle with 11,897 vehicles. Finally, San Bernardino, Mont Blanc and Fréjus present the lowest values, with 6,886, 4,044 and 4,307 vehicles per day.

³ Link to the iMONITRAF! WebGIS application: <http://sdi.eurac.edu/AlpinePoKforTransportandMobility/>

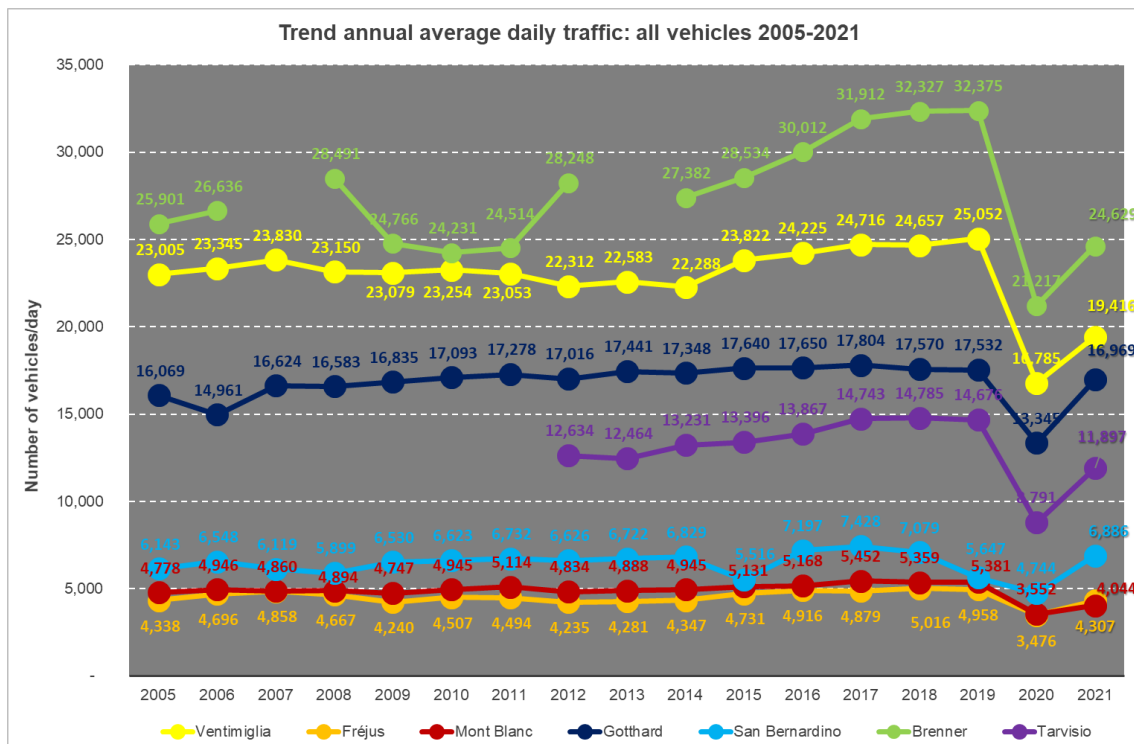


Figure 6: Annual average daily traffic: all vehicles per day

MAIN INSIGHTS: 88,100 heavy and light vehicles per day: +22.9% compared to 2020, -16.5% compared to 2019.

The analysis since 2005 shows different trends. If we consider the absolute traffic volumes, Brenner presents the highest values and a generalised increase of flows until 2019 (+25.0%) despite a significant reduction in years 2009-2011 due to the international economic crisis. In the long term (2005-2019), Ventimiglia and Gotthard also show an overall growth of vehicles (respectively +8.9% and +9.1%). In addition, Tarvisio reveals a generalised increase (+16.2%), but for this corridor, data is available only from 2012 onwards. Finally, from 2005 to 2019, Fréjus and Mont Blanc registered a generalised relative increase of more than 10% while absolute values are lower.

These growing trends until 2019 were broken by the two pandemic years 2020 and 2021. The restrictions caused by the COVID-19 pandemic have strongly reduced the flows along all corridors especially in 2020. Indeed, even compared to 2005, values registered in 2020 are significantly lower for all corridors: -30.4% for Tarvisio, -27.0% for Ventimiglia, -25.7% for Mont Blanc, -22.8% for San Bernardino, -19.9% for Fréjus, -18.1% for Brenner and -17.0% for Gotthard. In the short term (yearly variation between 2019 and 2020), this trend is even more evident. Tarvisio, Brenner, Mont Blanc, Ventimiglia and Fréjus register the highest decrease of vehicles (-40.1%, -34.5%, -34.0%, -33.0% and -29.9% respectively), whereas Gotthard and San Bernardino register lower decreases (-23.9% and -16.0%). Nevertheless, this remains the strongest decrease in volumes ever registered in the iMONITRAF! monitoring activity since 2005. Compared to 2020, 2021 shows a rebound of flows. For Brenner, Ventimiglia, Tarvisio, Mont Blanc and Fréjus data registered in 2021 are still sensibly lower than in 2019: -23.9%, -22.5%, -18.9%, -24.9% and -13.1%. Conversely, for Gotthard and San Bernardino the registered flows are almost equal or even higher than in 2019: -3.2% and +22.0%, showing a sensible rebound after the first pandemic year.

(2) Considering the **annual average daily traffic of heavy vehicles** (Figure 7), the aggregated number of heavy vehicles crossing all iMONITRAF! corridors was of about 23,738 vehicles

per day in 2021 (+12.1% compared to 2020 and -0.3% compared to 2019). Therefore, the values in 2021 were nearly back to the level registered in the last pre-pandemic year.

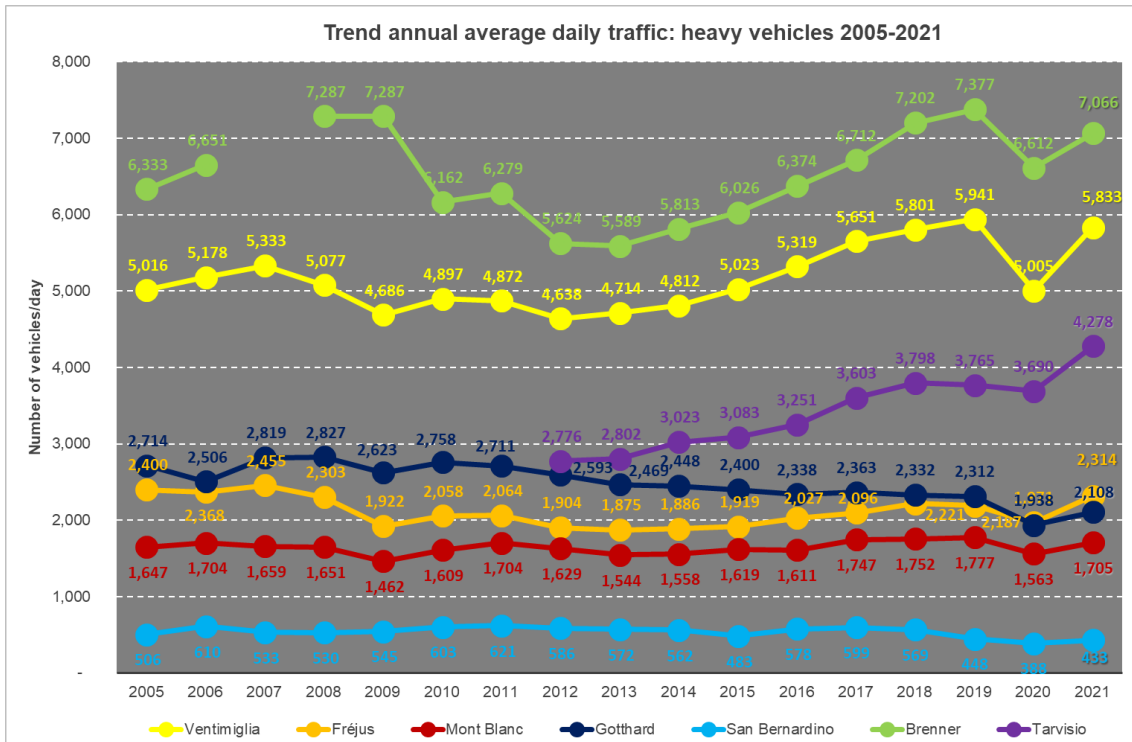


Figure 7: Annual average daily traffic: Heavy vehicles per day

MAIN INSIGHTS: Turning almost back to levels before the pandemic crisis: 23,700 vehicles per day in 2021, +12.1% compared to 2020, -0.3% compared to 2019.

In 2021, the highest number of heavy vehicles was registered at Brenner, where an average of 7,066 vehicles per day was counted (+6.9% compared to 2020 and -4.2% compared to 2019). Ventimiglia follows with 5,833 vehicles per day (+16.5% compared to 2020 and -1.8% compared to 2019). Along these two corridors, a constant increase has been registered since 2012, the trend has been inverted in 2020 due to the effects of the COVID-19 pandemic, while a rebound has been registered in 2021. A similar trend has affected also the other corridors with a lower amount of vehicles per day. Specifically, Gotthard registered 2,108 vehicles per day (+8.8% compared to 2020 and -8.8% compared to 2019), Mont Blanc 1,705 vehicles per day (+9.1% compared to 2020 and -4.0% compared to 2019), and San Bernardino 433 vehicles per day (+11.5% compared to 2020 and -3.3% compared to 2019). Two partial exceptions regard Tarvisio and Fréjus: in these corridors, the flows registered in 2021 are higher than those registered in the pre-pandemic year 2019. Specifically, Tarvisio registered 4,278 vehicles per day (+15.9% compared to 2020 and +13.6% compared to 2019) and Fréjus 2,314 vehicles per day (+17.4% compared to 2020 and +5.8% compared to 2019). The increase along the Tarvisio may be partially explained by the infrastructural works occurred at the Karawanks Tunnel (along the Tauern corridor) between September 2020 and July 2021. These have triggered a partial deviation of traffic to other close rail/road corridors, including Tarvisio. As regards the Fréjus, it has to be considered that the 2021-2019 increase is consistent with the average annual increase occurred between 2015 and 2019 (ca +4% per year). Additionally, the Mont Blanc Tunnel has been subject to extraordinary maintenance works in spring 2021, possibly causing a deviation of traffic also along the Fréjus.

By analysing the period 2005-2021, several phases can be distinguished: between 2005 and 2007, the volume of heavy vehicles increased at all corridors. This development is followed by a

decline until 2009, reflecting the impact of the economic crisis. The year 2010 showed some rebound (except for Brenner), followed by another generalised decrease in 2011-2013. In the period 2014-2019, a constant increase has been registered at Brenner and Ventimiglia. Tarvisio, Mont Blanc and Fréjus also showed an increase from 2014 to 2018 and a slight decrease in 2019. A stabilisation is visible along the Swiss corridor of Gotthard for the same period 2014-2019. Due to the COVID-19 pandemic, 2020 represents a decrease phase for all corridors. In particular, Brenner and Ventimiglia register the strongest variations, while Tarvisio and San Bernardino the lowest ones. However, a comparison between values registered in 2005 and 2019 reveals that only two corridors present a decades-long negative trend: Fréjus (-8.9%) and Gotthard (-14.8%). Brenner and Ventimiglia recovered the effects of the economic crisis (respectively, +16.5% and +18.4%). Mont Blanc also showed an increase (+7.9%). With a growth of +35.6%, Tarvisio registered the highest increase, but in this case comparison is made with 2012 due to a lack of previous data. Finally, as described above, 2021 shows a (at least partial) rebound for all corridors, with Fréjus, Ventimiglia and Tarvisio registering the highest increase compared to 2020 (+17.4%, +16.5% and +15.9%) and Brenner and Gotthard showing lower rebound effects (+6.9% and +8.8% compared to 2020).

(3) Considering the **annual average daily traffic for light vehicles** (Figure 8), the aggregated number of light vehicles crossing all iMONITRAF! corridors was at about 64,400 per day in 2021 (+26.9% compared to 2020 and -21.3% compared to 2019). Compared to heavy vehicles, the relative decrease registered for light vehicles during the two pandemic years is much higher. This is consistent with the mobility restrictions posed by the COVID-19 pandemic measures, especially to the movement of citizens rather than freight.

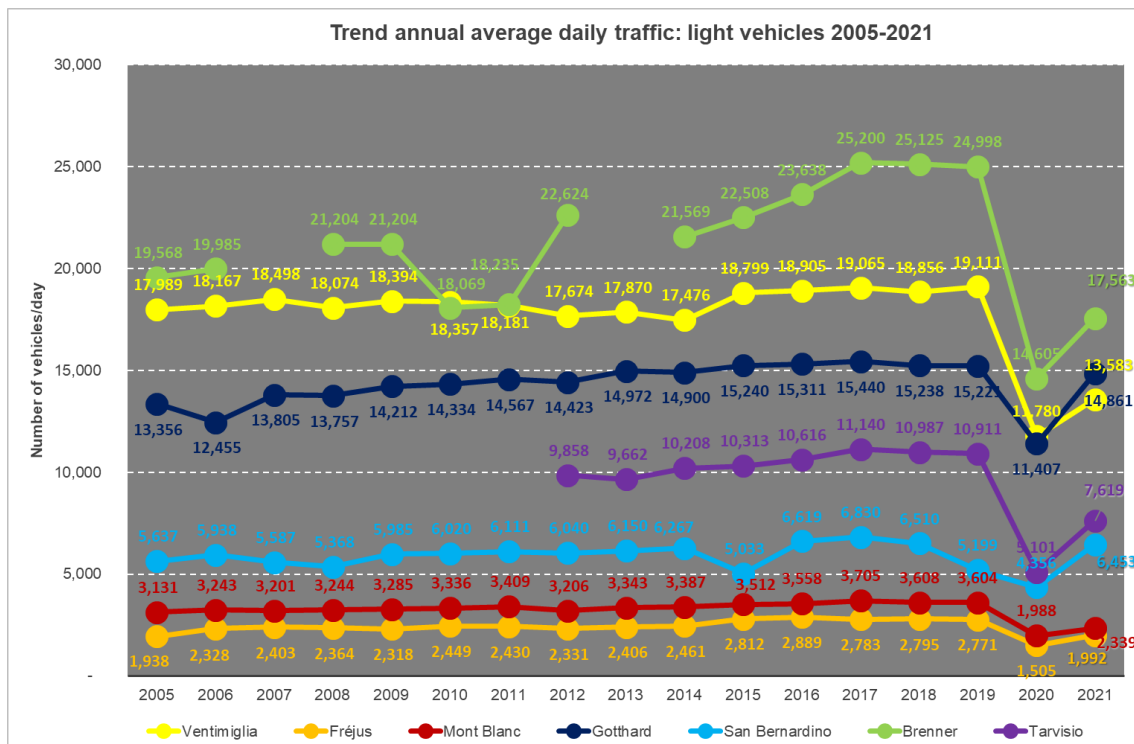


Figure 8: Annual average daily traffic: Light vehicles per day

MAIN INSIGHTS: Still a visible effect of the pandemic crisis: 64,400 vehicles per day, +26.9% compared to 2020, -21.3% compared to 2019.

Considering these framework conditions, the highest values of 2021 were recorded at Brenner, with 17,563 vehicles per day, followed by Gotthard (14,861), Ventimiglia (13,583), Tarvisio (7,619)

and San Bernardino (6,453). The number of transits between France and Italy along Mont Blanc and Fréjus was the lowest (respectively 2,339 and 1,992 vehicles per day). Compared to 2019 (the last pre-pandemic year), a decrease of about 30% is visible at most corridors: Mont Blanc (-35.1%), Tarvisio (-30.2%), Brenner (-29.7%), Ventimiglia (-28.9%) and Fréjus (-28.1%). The only exceptions regard Gotthard and San Bernardino (-2.4% and +24.1% in 2021 compared to 2019).

The analysis of the development since 2005 depicts a moderate increase of light vehicles until 2009, followed by a general stabilisation for the years 2010-2013 (not valid for the Brenner corridor, which registered a significant reduction of flows in 2010 and 2011). After this phase, a general increase is recognised for all corridors in 2014, 2015 (except for San Bernardino, for a temporary closure of the road and for an incomplete dataset), 2016 and 2017. In 2018 and 2019 the trend was negative again (overall -1.2% in 2018 and -1.6% in 2019), followed by the strong decrease characterising 2020 due to the COVID-19 pandemic (-38% compared to 2019) and the partial rebound occurred in 2021 (+27% compared to 2020). Comprehensively, until 2019, a generalised increase of flows along all corridors was registered. In relative terms, the highest growth compared to 2005 is detected at Fréjus (+43.0%), followed by Brenner (+27.7%), Mont Blanc (+15.1%), and Gotthard (+14.0%). Tarvisio, for which data for 2019 is compared with that of 2012, also reveals an increase (+10.7%). All these trends have been reversed by the exceptional events of 2020. However, it is relevant to notice that in 2021 a clear renewed rise is registered across all corridors (+26.9% on average compared to 2020).

Indicator “Road traffic volumes” – Monthly data 2019-2021

(1) By observing the **monthly average daily traffic for all vehicles in 2019, 2020 and 2021** (Figure 9), it is possible to recognise the impacts of the two pandemic waves occurred in spring and autumn 2020 respectively, due to the lockdowns in this period. At the same time, the partial rebounds occurred in the summer months is visible.

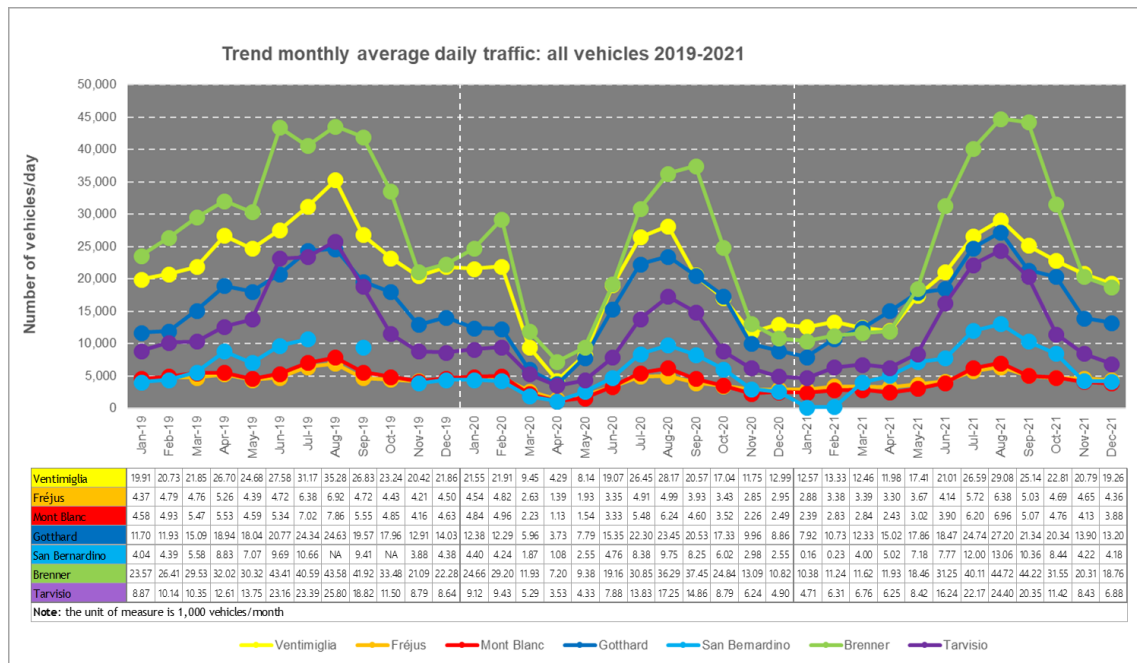


Figure 9: Monthly average daily traffic: all vehicles per day 2019-2021
MAIN INSIGHTS: Peaks in in the summer months, especially for the corridors with high traffic volumes. Main drops related to the Covid-19 pandemic crisis in spring 2020 and winter 2020-2021.

This trend is clearly visible when comparing monthly data between 2019 and 2020. In March, April and May 2020, values registered along all corridors are on average lower by 73.4%, 92.5% and 79.3% compared to the same months in 2019. The highest reductions are visible for Mont Blanc in March and April (-80.7% and -97.5%), and for Tarvisio in May (-91.0%). A similar condition is visible for October, November and December 2020, with an average decrease of 31.3%, 52.4% and 59.3% compared to the same months in 2019 (data of October 2019 not available for San Bernardino). During the first months of 2021, the prevention measures have been kept in several EU countries and this is reflected by the flows registered in the timeframe January-April 2021 compared to the same period in 2019. On average, registered flows in January, March and April 2021 are lower by 50.0%, 37.4%, and 46.5% compared to the same months in 2019. The highest decreases are registered for San Bernardino (-96.1%) in January, and for Brenner in March and April (-60.6% and -62.8%). Thanks to the diffusion of vaccines, the second half of 2021 has registered much higher flows, which are closer to the pre-pandemic trend and in some cases even higher. For instance, the months of July, September and November 2021 have registered on average a variation of flows of -4.1%, +3.5% and +2.9% compared to the same months of 2019 across all corridors, with the strongest positive peaks for San Bernardino in July and September (+12.5% and +10.1%) and for Fréjus in November (+10.5%).

(2) The general trend affecting all vehicles is consistent with that one regarding **monthly average daily traffic for heavy and light vehicles** respectively. However, some differences may be noticed (Figure 8:10 and Figure 11). In particular, the reduction of road traffic volumes experienced by heavy vehicles both in 2020 and 2021 is less evident than the one affecting light vehicles (according to the different measures adopted for individual mobility and freight transport to address the pandemic crisis).

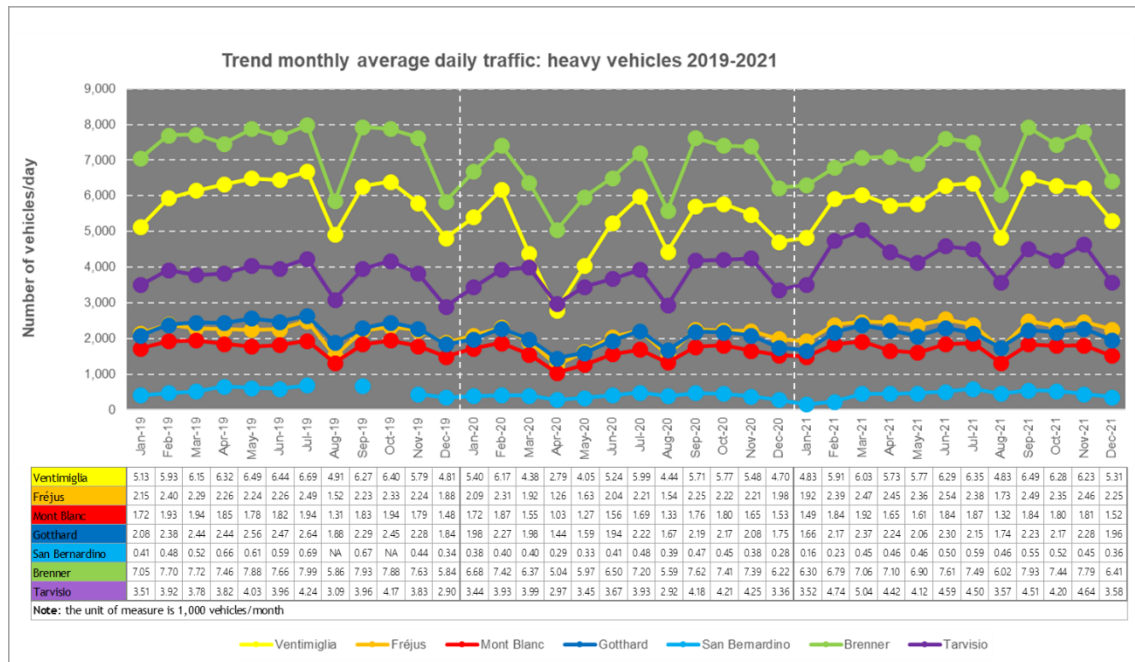


Figure 10: Monthly average daily traffic: Heavy vehicles per day 2019-2021
MAIN INSIGHTS: Visible waves especially in spring 2020 due to the Covid-19 pandemic crisis, rebound in 2021.

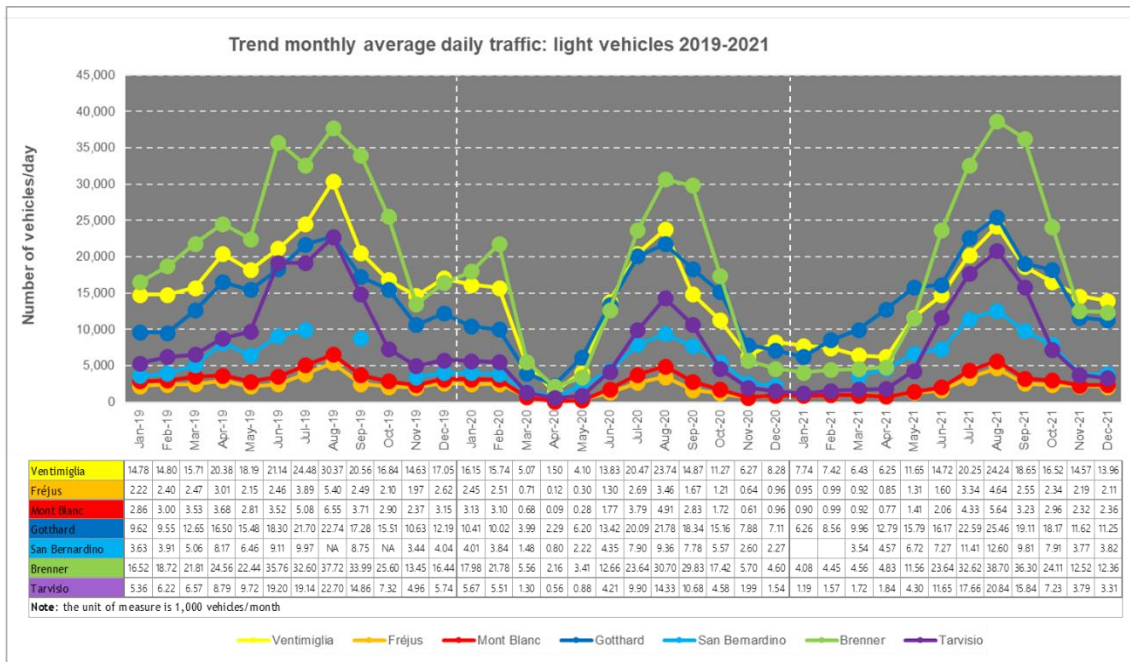


Figure 11: Monthly average daily traffic: Light vehicles per day 2019-2021

MAIN INSIGHTS: Very visible waves due to the Covid-19 pandemic crisis in spring 2020 and winter 2020-2021, rebound after the third wave in the second half year 2021.

Some considerations are relevant for four pandemic-related periods:

- First pandemic wave:** In March 2020, the average daily number of heavy vehicles along the different corridors was on average 17.2% lower than in March 2019. Instead, the reduction in the same month for light vehicles was of 56.6%. Similar differences are visible also between April 2020 and 2019 (-42.3% for heavy vehicles and -79.3% for light ones), as well as between May 2020 and 2019 (-30.7% for heavy vehicles and -64.0% for light ones).
- Second pandemic wave:** In Autumn 2020, a similar condition is visible, although the reductions are less evident. In October 2020, daily heavy vehicles flows were 6.4% lower than in October 2019; while the light vehicle ones were 21.6% lower. As for November 2020, the daily number of heavy vehicles along iMONITRAF! corridors decreased by 4.1% compared to the same month in 2019. For light vehicle such reduction was of 33.3%.
- Third pandemic wave:** In winter and spring 2020/2021, a new relevant decrease of flows is registered for light vehicles, while the condition is much more stable for heavy vehicles. In January 2021, light-vehicles flows are 65.9% lower than in January 2019, while heavy-vehicles flows are lower by 17.5%. In March 2021, the variation is -57.1% for light vehicles and +2.0% for heavy vehicles compared to March 2019. Finally, in April 2021 compared to April 2019, such variation is of -63.7% and -5.6% for light and heavy vehicles respectively.
- Rebound after the third wave:** In the second half of 2021, a significant rebound is similarly registered for both light and heavy vehicles. This is visible by observing the data registered in July, September and November 2021 compared to 2019. For all these months, the variation of light-vehicle flows ranges between -5.1% and +2.3%; while the variation of heavy-vehicle flows is between -6.6% and +6.1%.

Indicator “Transalpine freight transport rail and road” – Annual data

(1) From west to east, six corridors of the iMONITRAF! network allow a multimodal (rail/road) connection (Ventimiglia, Mont Cenis/Fréjus, Simplon, Gotthard, Brenner and Tauern), while two grant only a road connection (Mont Blanc and San Bernardino). Regarding the **amount of tons transported along all the corridors by road and rail**, in 2021 165.9 Mt were carried across the above-mentioned corridors, 109.5 Mt by road (66%) and 56.4 Mt by rail (34%). The total amount registered in 2021 is by 11% higher than 2020 (first pandemic year) and even 4% higher than 2019 (last year before the pandemic). The overall modal split road-rail has slightly changed, with +1% in favour of rail. The increase registered in 2021 is consistent with the data regarding flows presented above, confirming the new increase of the freight transport sector after the first pandemic waves. The increase of transported tons between 2020 and 2021 affects both road and rail transport (+9% for road and +16% for rail on average across all corridors).

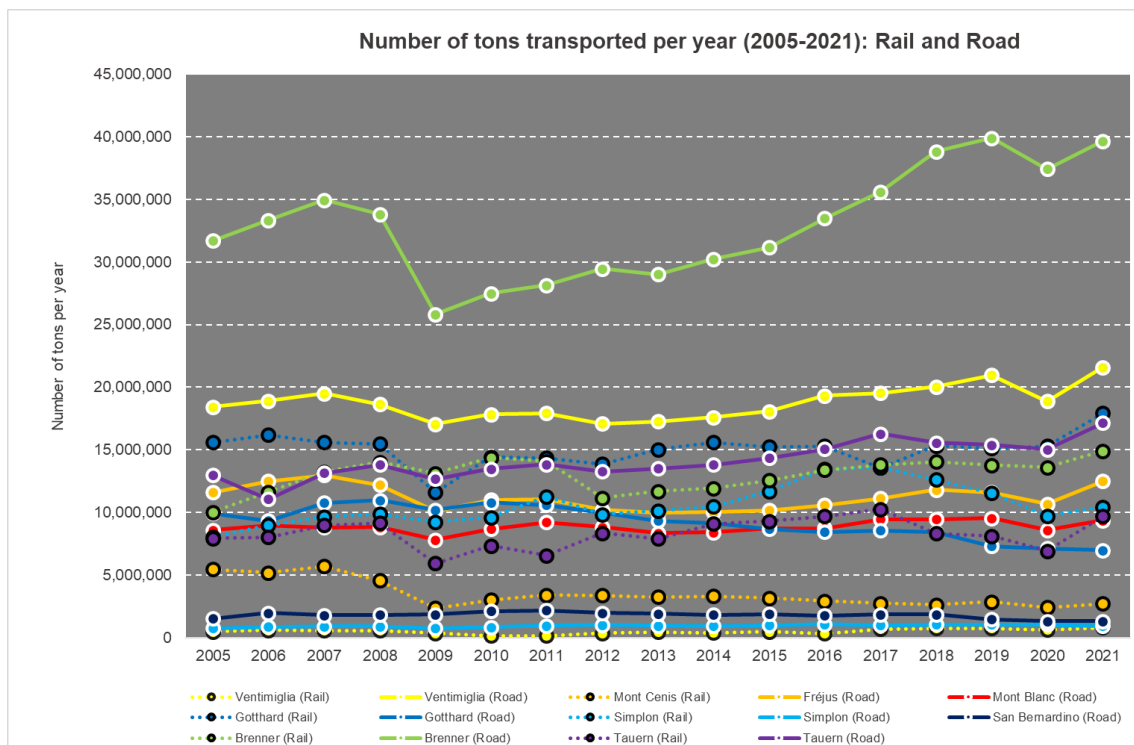


Figure 12: transported tons per corridor

MAIN INSIGHTS: 109.5 Mt by road (66%) and 56.4 Mt by rail (34%): + 11% compared to 2020, + 4% compared to 2019.

As regards the single corridors, an increase of the overall freight volumes is detected at Brenner (from 51.0 Mt to 54.5 Mt). This trend involves especially rail transport (passing from 13.6 Mt to 14.9 Mt; i.e. +10%), but also road transport (passing from 37.4 Mt to 39.7 Mt). Along the Tauern, the other IT-AT corridor, the number of tons transported is less than half of the Brenner and it has increased by 22% in the past year: 26.8 Mt in 2021 against 21.9 Mt in 2020. The trend affects both road (passing from 15.0 Mt to 17.1 Mt; i.e. +14%) and especially rail (from 6.9 Mt to 9.6 Mt; +40%). Swiss corridors register an increase in transported tons, apart from San Bernardino where the amount is almost unchanged (+1.0% from 2020 to 2021). At Simplon, an increase of volumes by 6% from 2020 to 2021 was caused by rail (from 9.7 Mt to 10.4 Mt; i.e. +7%) whereas the road component has decreased by 12% (from 1.05 Mt to 0.93 Mt). At Gotthard, the increase between 2021 and 2022 was of 11% (+17% for the rail component and -2% for the road one). Even along the French-Italian corridors, the total amount of transported tons has increased. The percentage of rail transport continued to remain low, although an increase of transported tons is registered

also for rail. In 2021 at Ventimiglia, the rail component counted for about 4% of overall freight transport (0.8 Mt out of 22.4 Mt), +1% compared to 2020. Along the Mont Blanc, where no rail connection is available, goods transported by road were increased compared to the previous year (9.4 Mt; i.e. +9% compared to 2020). Finally, the share of rail transport at Fréjus/Mont Cenis was higher as compared to other French-Italian corridors: it counted for about 18% of the total (2.7 Mt out of 15.2 Mt), i.e. same distribution of 2020.

(2) Considering **modal split** (Figure 13), the Swiss-Italian corridors of Simplon and Gotthard were the corridors with the highest share of rail and the only ones that exceeded the threshold of 50% of goods transported by train also in 2021.

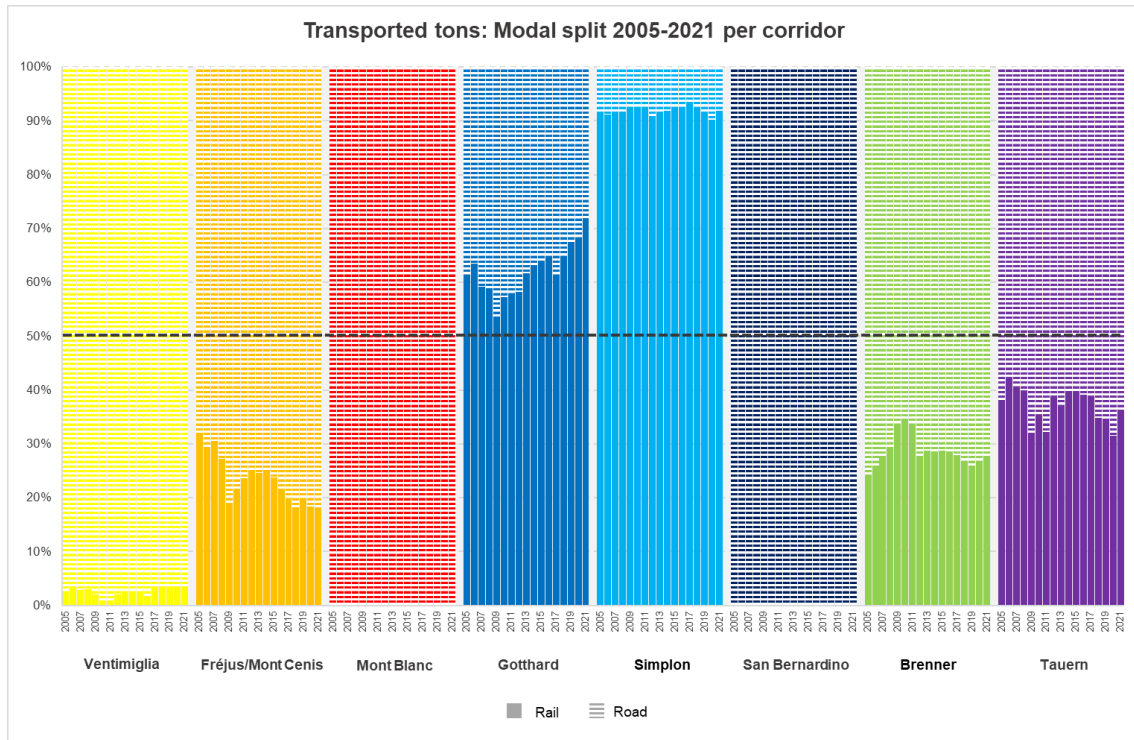


Figure 13: Transported tons, modal split per corridor

MAIN INSIGHTS: Visible rail increase in Switzerland due to opening of the Gotthard base tunnel.

Volumes at Gotthard increased in the period 2009-2014 and remained stable at 64% in the years 2015-2016, decreasing to 61% in 2017 (due to a construction accident on the German Upper Rhine rail access in Rastatt) and again increasing in 2018, reaching 65%. During the period 2019-2021, the percentage further increased despite the COVID-19 pandemic in 2020 and the following rebound in 2021 (67% in 2019, 68% in 2020 and 72% in 2021). This rail modal split in 2021 is thus the highest value in the period 2005-2021 on the Gotthard. Simplon always presented values above 90%, and in 2021, the share was at 92%, which is 2% more than in 2020 (first pandemic year). Along Brenner, rail transport had shown a decreasing trend since 2010, ending at 28% in 2014. In 2015 and 2016, a 1% increase was visible (from 28% to 29%), but in 2017, 2018 and 2019 the share decreased again by 1% per year, reaching the values of 2006 (26%). In 2020 and in 2021, a slight increase by 1% compared to 2019 is visible, reaching the value of 2017 (27%). In 2021, the percentage at Tauern was 36% for rail (5% more than in 2020 after a constant decrease since 2015) and 64% for road. Referring to the French-Italian corridors, the data for 2021 shows an almost stable trend compared to 2020: the rail component for Fréjus/Mont Cenis is stable at 18%; while Ventimiglia registered a slight increase in the rail split by 1% (4% rail, 97%

road). Finally, Mont Blanc and San Bernardino do not have a transalpine rail connection, therefore 100% of freight is transported across their corridors on road.

(3) When referring to the **railway component** (Figure 14:14), it is also possible to distinguish the type of service between conventional transport, unaccompanied combined transport (UCT) and accompanied combined transport (ACT). Along the two French-Italian corridors with rail connection (i.e. Ventimiglia and Mont Cenis), UCT and conventional rail transport play the major role. In 2021, along the Ventimiglia line, UCT constituted 43% of rail movements and the remaining 57% were conventional. Along Mont Cenis, UCT counted for about 48% and conventional transport for 50%, while ACT was 2%. The condition was similar along the two Swiss corridors, with UCT as the main component (69% at Gotthard and 77% at Simplon), followed by conventional transport (31% at Gotthard and 12% at Simplon). Along Brenner, UCT counted for 56% of total freight transport, followed by conventional transport and ACT (connection Wörgl-Brennersee-Trento), with, respectively, 20% and 24% of total volumes. Finally, at Tauern, most of the rail traffic (69%) is conventional, followed by UCT (30%) and ACT (1%).

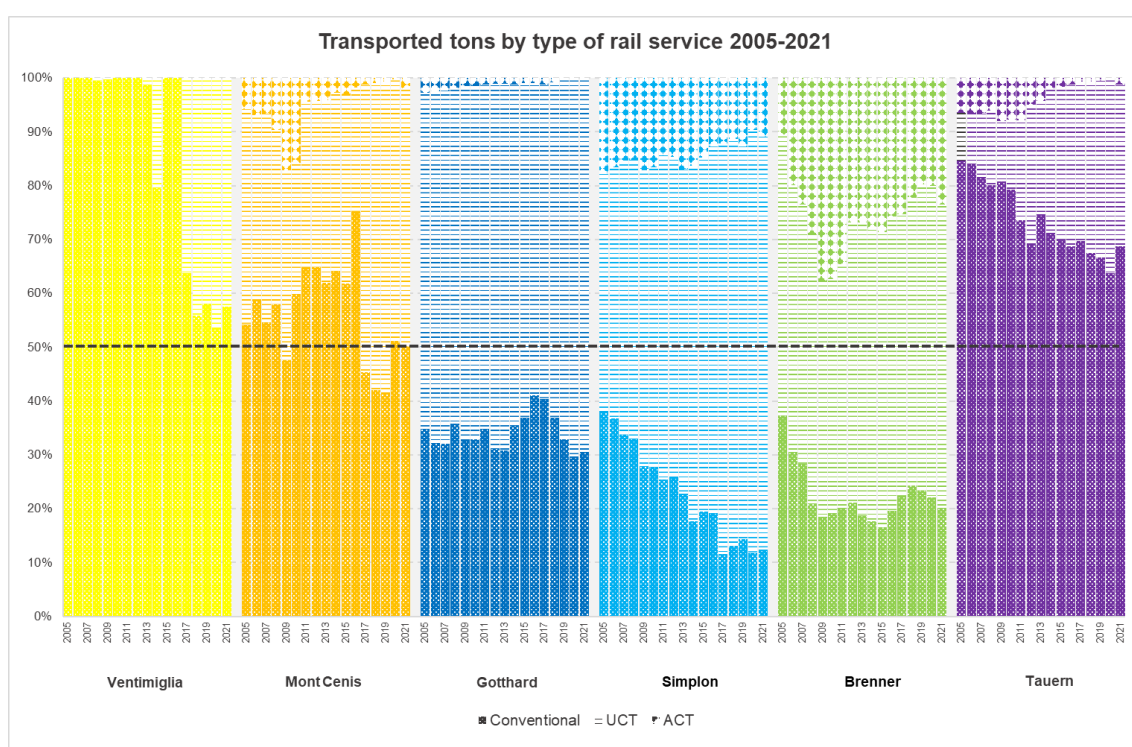


Figure 14: Transported tons by rail, type of services
MAIN INSIGHTS: Conventional rail service less sensitive during the Covid-19 pandemic crisis.

Indicator “Transalpine freight transport rail and road” – Monthly data 2019-2021

(1) Figure 15 shows the number of tons transported by road and rail per month during the years 2019, 2020 and 2021 along the eight transalpine corridors of Ventimiglia, Fréjus/Mont Cenis, Mont Blanc, Gotthard, Simplon, San Bernardino, Brenner and Tauern. The impact of the COVID-19 pandemic and of the following rebound is particularly evident by comparing for each corridor and component (road and rail) the data registered in the same month in 2021, 2020 and 2019. In particular, spring 2020 and winter 2020-2021 show the most evident impacts of the pandemic crisis.

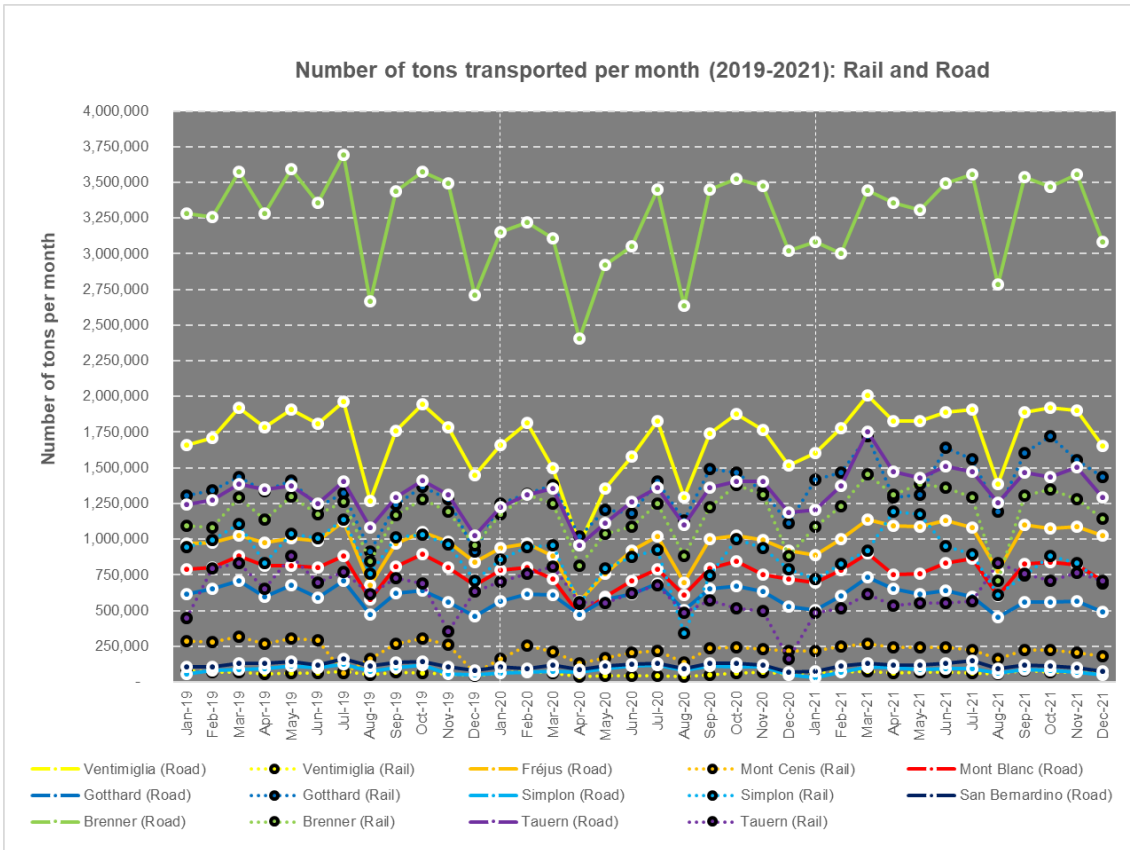


Figure 15: Transported tons per corridor per month (2019-2021)

MAIN INSIGHTS: Similar waves as in road transport. Most visible waves in spring 2020 and winter 2020-2021.

Some considerations are relevant for four pandemic-related periods:

- First pandemic wave:** The highest decreases were registered between March, April, May and June 2020 and 2019. The number of transported tones across all eight corridors was on average 11.8% lower in March 2020 compared to March 2019, 32.2% lower in April 2020 compared to April 2019, 24.5% lower in May 2020 compared to May 2019, and 8.5% lower in June 2020 compared to June 2019. Focusing on April 2020 (the month with the strongest decrease), different but consistent trends are visible across the corridors. As regards the road component, Ventimiglia registered the highest decrease (-46.0%), followed by Mont Blanc (-42.2%) and Fréjus (-41.9%). Smaller reductions were registered along the Swiss corridors: -32.1% for San Bernardino, -27.1% for Simplon and -20.6% for Gotthard. Finally, the AT-IT corridors of Brenner and Tauern experienced a reduction of transported tons of 26.6% and 28.8% respectively. Similar reductions affected also the rail component in April 2020 compared to April 2019. In particular, the highest decreases were registered for Mont Cenis (-51.8%), Simplon (-34.6%), Ventimiglia (-32.7%) and Brenner (-28.5%). Minor decreases affected Gotthard (-23.9%) and Tauern (-14.2%).
- Second pandemic wave:** The comparison between 2020 and 2019 shows an almost opposite trend during the period October-December 2020. The amount of tons transported along the eight corridors were in most cases higher than in the same months of 2019. After a small reduction registered in October 2020 compared to October 2019 (-4.3% on average across all corridors), an average increase by 12.7% and 22.1% was registered between November and December 2020 and 2019 across all corridors. Focusing on December 2020 (the month with the strongest increase), some differences are

visible across corridors. As regards the road component, the highest increases were registered for Tauern (+16.1%), Gotthard (15.2%), Brenner (+11.6%) and Fréjus (+9.2%). Minor positive variations affected Mont Blanc (+6.7%), Ventimiglia (+4.6%) and Simplon (+3.9%). Finally, an opposite trend was registered for San Bernardino, where the amount of tons transported by road in December 2020 was 13.1% lower than in December 2019. As regards the rail component, the most evident increase affected Mont Cenis (+273.5% compared to December 2019), although the absolute amount of tons transported by rails remains low compared to those transported by road along the Fréjus (0.22 Mt against 0.92 Mt in December 2020). Other increases regard Ventimiglia (+31.5%), Gotthard (+21.9%) and Simplon (+11.4%). Instead, Brenner and Tauern registered a decrease of tons transported by rail in December 2020 compared to December 2019 (-7.7% and -74.7% respectively).

- **Third pandemic wave:** In winter and spring 2020/2021, an heterogeneous variation is registered. In January 2021, registered data were significantly lower than those of January 2019, according to the pandemic wave affecting that period. Overall, road volumes were 12% lower (-15.2% for road and -7.8% for rail). The strongest decreases were registered for Simplon on road (-40.8%), San Bernardino on road (-30.5%) and Fréjus on rail (-24.9%). Afterwards, in March and April 2021, the transported tons have re-reached the pre-pandemic values along most of the corridors. Overall, the transported tons registered in these two months were 3.7% and 4.3% higher than in the same months of 2019. This applies especially to the road transport (+8.4% and +3.2% on average in March and April 2021 compared to the same months in 2019), and partially to the rail sector (-2.6% and +5.9% on average in March and April 2021 compared to the same months in 2019). In particular, the most evident increases were registered for Simplon on rail (+42.8% in April 2021 compared to 2019), Tauern on road (+26.6% in March 2021 compared to 2019), and Simplon on road (+20.0% in March 2021 compared to 2019).
- **Rebound after the third wave:** In the second half of 2021, an overall rebound to the pre-pandemic data especially in autumn 2021 is visible. To explain this trend, we focus on the months of July, September and November 2021 in comparison with 2019. In July 2021, the overall amount of transported tons was 3% lower than in July 2019 (-3% for road and -1% for rail respectively). However, the trend reversed in autumn, with an increase by 5% in September 2021 compared to September 2019 (+5% for both road and rail), and by 8% in November 2021 compared to 2019 (+6% for road and +14% for rail). These values highlight the general resurgence of the transport volumes in the second half of 2021. The strongest increases of autumn 2021 regard Simplon and Tauern for road transport (+24.7% along Simplon in November 2021 compared to November 2019; +13.3% and +14.9% along Tauern in September and November 2021 compared to the same months in 2019). For rail volumes, the highest increases are visible along Gotthard (+29.3% and +21.3% in September and November 2021 compared to 2019), as well as along Tauern (+115.7% in November 2021 compared to 2019).

(2) As regards the **monthly modal split** (Figure 16) along the six corridors served by both road and rail (i.e. Ventimiglia, Fréjus/Mont Cenis, Gotthard, Simplon, Brenner and Tauern), less evident variations are registered between monthly data of 2021, 2020 and 2019.



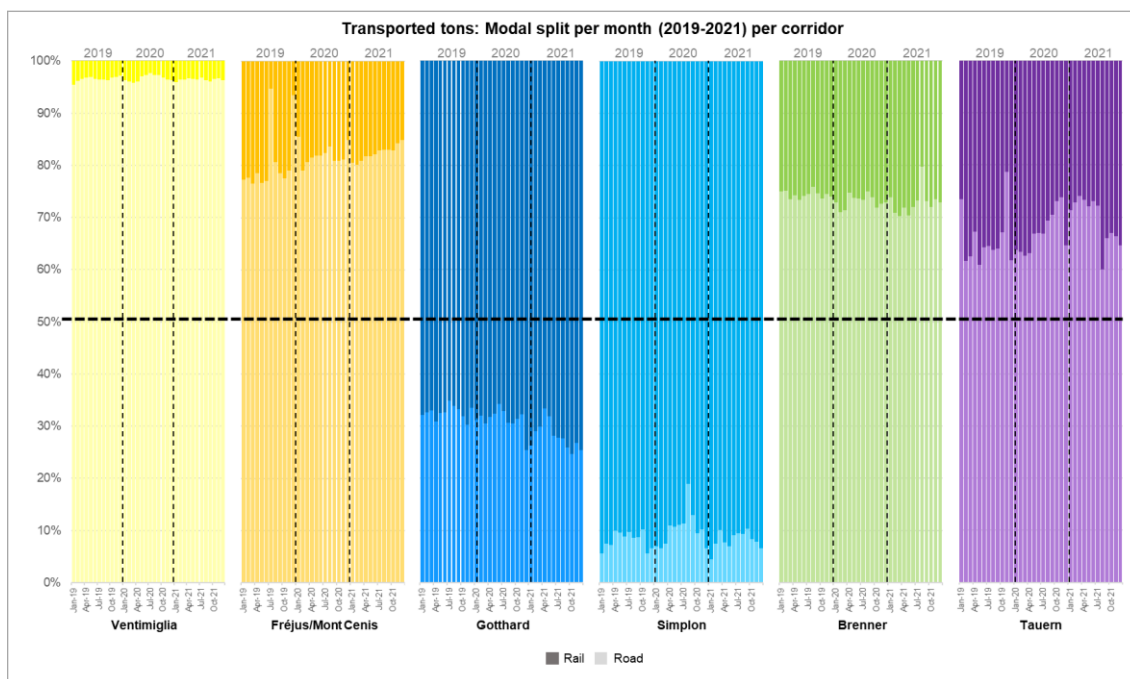


Figure 16: Transported tons, modal split per corridor per month (2019-2021)

MAIN INSIGHTS: The effects of the Covid-19 pandemic crisis on the modal split is less evident than for the overall amount of transported tons.

During the **first pandemic wave** (March-June 2020), the breakdown of tons between road and rail was very similar to that one registered in the same months of 2019. Only in three cases the share of tons transported by rail was higher in 2020 compared to 2019: along the Gotthard in March (+2% in March 2020 compared to March 2019), along the Brenner in March (+2% in March 2020 compared to March 2019), and along the Tauern in April (+4% in April 2020 compared to April 2019). Conversely, the strongest decreases of the rail split were registered along the Mont Cenis from March to June 2020 (respectively -4%, -3%, -5% and -5% in each month compared to the same months of 2019); as well as along the Tauern in May 2020 (-6% compared to May 2019). For all the other corridors, variations were smaller than +/-2% in all the months of the first pandemic wave. During the **second pandemic wave** (October-December 2020), a similar trend was registered. However, two meaningful variations are visible by comparing data of the months of December 2020 and December 2019 for the corridors of Mont Cenis and Tauern. Mont Cenis registered an increase by 13% of its rail modal split (19% in December 2020 against 7% in December 2019). Conversely, Tauern experienced a decrease of the rail split (-26%; 12% in December 2020 against 38% in December 2019). During the **third pandemic wave** (January-April 2021), the share of tons transported on rail was similar to the same period in 2019 (with variations in the range +/-5% for most corridors). The most relevant exception regard the Tauern, where the rail share registered a decrease by 11% and 12% in favour of the road respectively in February and March 2021 compared to the same months in 2019. Finally, during the **rebound phase after the third wave** (second half of 2021), the share of tons transported on rail has registered a meaningful increase in various cases. In particular, along Fréjus, an increase by 9% of the rail share has been registered in December 2021 compared to 2019 (although a decrease by ca 5% was registered in the previous period September-November 2021). For Gotthard, an increase by 7% and 8% has been registered in September and December 2021 compared to 2019. Finally, Tauern registered increase of the rail share by 12% in November 2021 against November 2019. The other corridors (i.e. Ventimiglia, Simplon and Brenner) have registered minor variations in the range +/-2%.

Indicator “Air pollution concentrations measured” – Annual data

(1) Figure 17: illustrates the trend in annual average for **nitrogen dioxide (NO₂)** ambient concentrations between 2005 and 2021 near the highways, since NO₂ is mainly related to road transport (and particularly to diesel vehicles). In general terms, the year 2021 registered a decrease in about half of the measuring stations (Mutters, Vomp, Oberaudorf, Erstfeld, Altdorf and Quliano), no variation for two stations (Camignolo and Entreves) and an increase for the remaining stations. This condition is strongly linked to the new increase of flows in 2021 after the first pandemic year 2020, and the related impacts on air pollution.

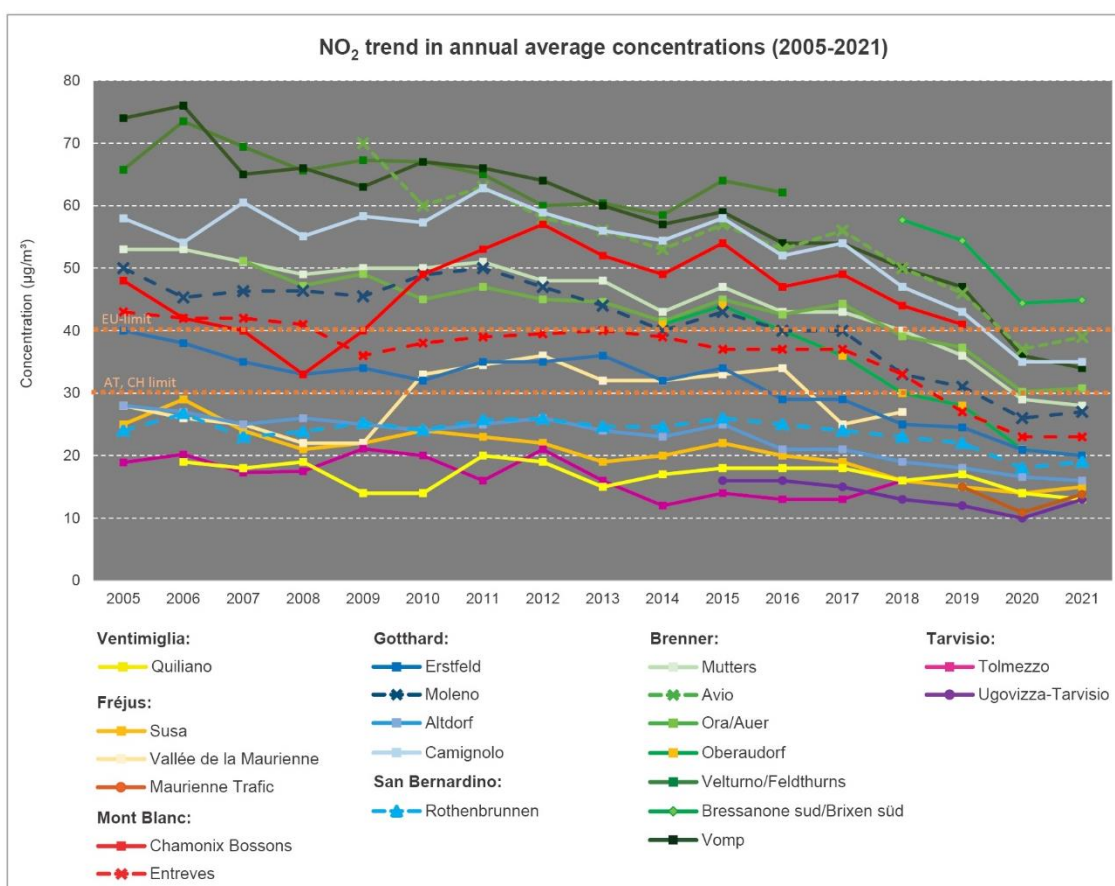


Figure 17: NO₂ trend in annual average concentrations⁴

MAIN INSIGHTS: Slight rebound in 2021 of the positive effects occurred in 2020 due to the Covid-19 pandemic crisis.

As in the last years, the highest concentrations in 2021 were measured along the Brenner (green colour scale), Mont Blanc (red) and Gotthard (blue) corridors, while lower values are visible along Fréjus, Ventimiglia, San Bernardino and Tarvisio (orange, yellow, light blue and violet colours). This result is related to the road traffic volumes presented in Figures 6-11, but it includes other effects, as well: composition of vehicle fleet (share of vehicle categories, share of EURO classes) and meteorology. In 2021, the annual average values of NO₂ exceeded the EU annual limit value of 40 µg/m³ only for the Bressanone sud/Brixen süd station along the Brenner corridor (45 µg/m³), while the other three highest registered value were 39 µg/m³ (Avio station along the Brenner), 35 µg/m³ (Camignolo station along the Gotthard) and 34 µg/m³ (Vomp station along the Brenner). This trend is in line with the data of 2020, but significantly lower than 2019, when five stations

⁴ The value for the station Vallée de la Maurienne in 2011 represents the average 2010-2012; the value for Entreves in 2011 and 2012 represents the average 2010-2013.

registered values above the EU annual limit. Compared to 2020, the highest decreases in NO₂ concentration have been registered in Quiliano (Ventimiglia; -7%) and Vomp (Brenner; -6%); while the highest increases affected Ugovizza-Tarvisio (Tarvisio; +30%) and Susa (Fréjus; +7%). On average, the variation registered across the measuring stations was +1%.

(2) Similar to the description of NO₂, the analysis of the **particulate matter (PM₁₀)** concentration is restricted at the roadside stations (Figure 18: 18). For this indicator, the two stations of Bressanone sud/Brixen süd and Ugovizza-Tarvisio are considered, too. Furthermore, data for the stations of Vallée de la Maurienne (Fréjus) are replaced by Maurienne Trafic since 2019, and data regarding Chamonix Bossons (Mont Blanc) is not available for 2020 and 2021. Compared to 2020, heterogeneous trends are visible.

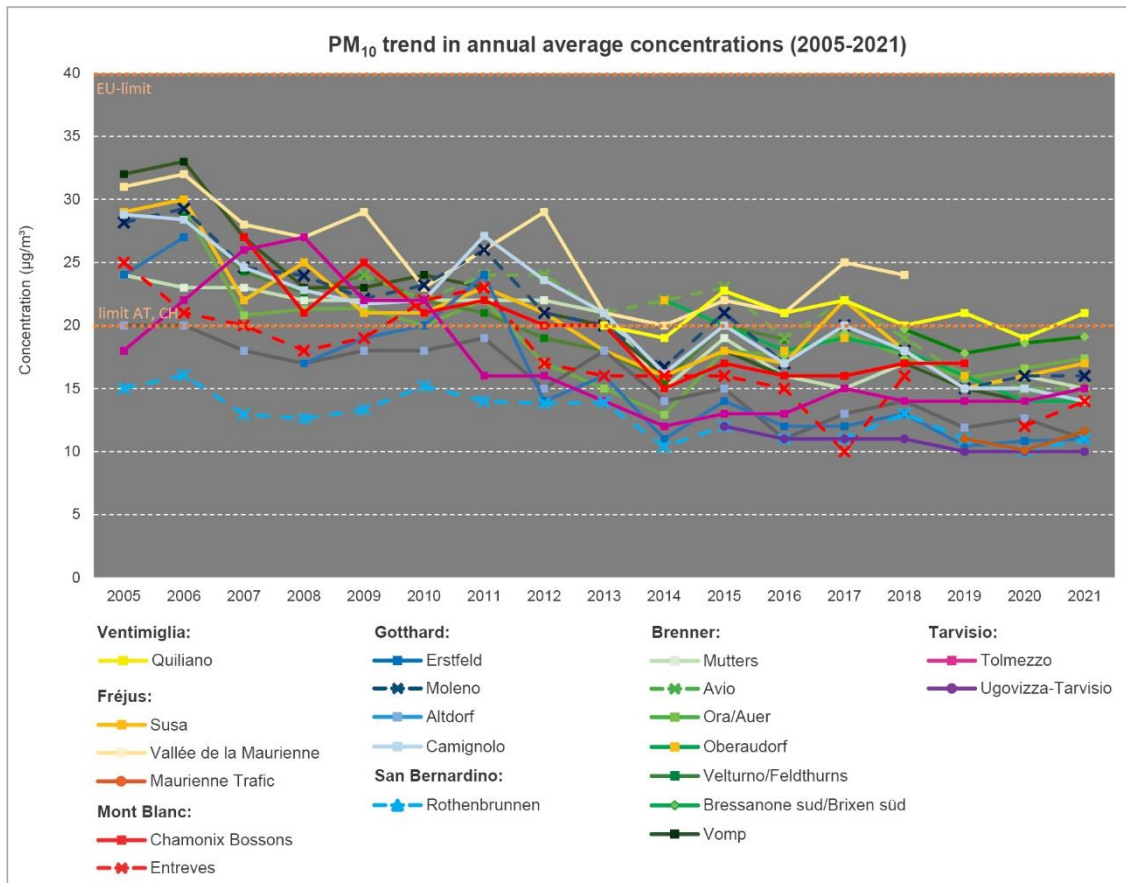


Figure 18: PM₁₀ trend in annual average concentrations⁵

MAIN INSIGHTS: Similar rebounds effects (in the period 2021-2020) are visible but less pronounced than for NO₂.

For three stations (Mutters, Altdorf and Camignolo), PM₁₀ concentrations have decreased by 6% to 13%. For five stations (Avio, Vomp, Oberaudorf, Molen and Ugovizza-Tarvisio), values are the same as in 2020. Finally, for the remaining stations, values have increased by 2% to 17%. The highest PM₁₀ concentrations (21 and 19 µg/m³) has been registered at Quliano (Ventimiglia) and Bressanone sud/Brixen süd (Brenner). Conversely, the lowest value (10/11 µg/m³) regarded Altdorf and Erstfeld (Gotthard), Rothenbrunnen (San Bernardino) and Ugovizza-Tarvisio (Tarvisio). The limit value for the annual average that has been fixed by the EU (40 µg/m³) was not

⁵ The value for Vallée de la Maurienne in 2011 represents the average of the years 2010 and 2012.

exceeded at any station and the limit values of Austria and Switzerland (20 µg/m³) were not exceeded at any Austrian or Swiss station.

A time series analysis reveals a fluctuating trend of this indicator. After a general decrease between 2005 and 2014, concentrations started slightly increasing until 2018 and then decreased again in 2019, while remaining almost stable in 2020 and 2021. Peaks in 2006, 2011, 2015, 2017 may have been caused by extremely hot weather periods in the Alps during summer months. A similar feature – but less significant – may also be recognised for NO₂ (see Figure 17:17). For PM₁₀, the value in 2017 in the Vallée de la Maurienne marks an exception, which has not been explained thus far.

A couple of caveats is necessary: PM₁₀ concentrations are (more strongly than NO₂) influenced by sources other than transport such as wood heating installations. This partially explains why the influence of the COVID-19 pandemic is less evident for the PM₁₀ than for the NO₂. Secondary PM₁₀, built from gaseous precursor concentrations (NO_x, SO₂, NH₃, VOC), can contribute to half of the PM₁₀ concentrations measured. The long-term trends can therefore not only be traced back to the development of PM₁₀ emissions of road vehicles.

Indicator “Air pollution concentrations measured” – Monthly data 2019-2020

(1) Figure 17:19 complements the previous data by focusing on the monthly trend for **nitrogen dioxide (NO₂)** ambient concentration during the period 2019-2021. This allows a more accurate observation of how concentration values registered before the COVID-19 pandemic (2019) have changed during 2020 and 2021. As expectable, 2021 shows a rebound of the decreasing trend affecting 2020, especially in spring and winter.

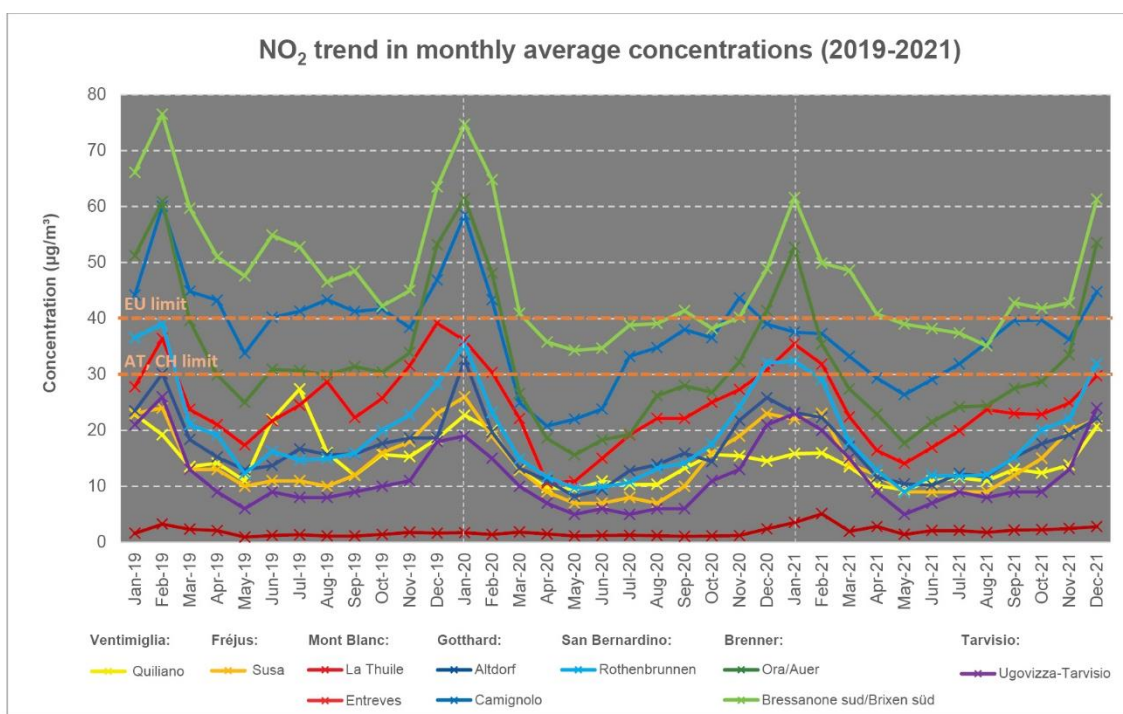


Figure 19: NO₂ trend in monthly average concentrations for 2019-2021

MAIN INSIGHTS: Partial rebound of the monthly concentrations in 2021 compared to 2020, especially in spring (period of the first Covid-19 pandemic wave in 2020).

Monthly data for the year 2019 shows a fluctuation of NO₂ ambient concentration that is mostly consistent across all corridors. The highest values are generally registered at the beginning and end of the year (February and December 2019), while the lowest one affect the summer months. Due to the impacts of the COVID-19 pandemic, this pattern is not visible in 2020. Indeed, after a peak value reached in January 2020 for all corridors (apart from Entreves, Mont Blanc), a significant decrease of values is registered between February and May 2020. This is followed by a small increase in the period June-December 2020, which is however significantly less evident than that one shaping 2019. 2021 shows a partial re-alignment to the pattern of 2019. In particular, in the first months of the year, most corridors do not register such a strong drop as the one registered in 2020. However, the peak reached in December 2021 is still lower than that one shaping December 2019. The impacts of the COVID-19 waves are visible also by comparing values registered in the same month between the three years for all measurement stations. Between 2020 and 2019, the decreases registered in March, May and July were on average of 22.2%, 23.4% and 28.9% across all corridors. When it comes to 2021, the difference with 2019 is still visible but less evident considering the same months: -9.7%, -12.2% and -14.5% in March, May and July.

(2) Figure 17:20 focuses on the monthly trend for **particulate matter (PM₁₀)** ambient concentration during the period 2019-2021. For sake of consistency, the same measurement stations considered above are taken into account, i.e. Quiliano (Ventimiglia), Susa (Fréjus), Rothenbrunnen (San Bernardino), Ugovizza-Tarvisio (Tarvisio), La Thuile and Entreves (Mont Blanc), Altdorf and Camignolo (Gotthard), and Ora/Auer and Bressanone Sud/Brixen Süd (Brenner).

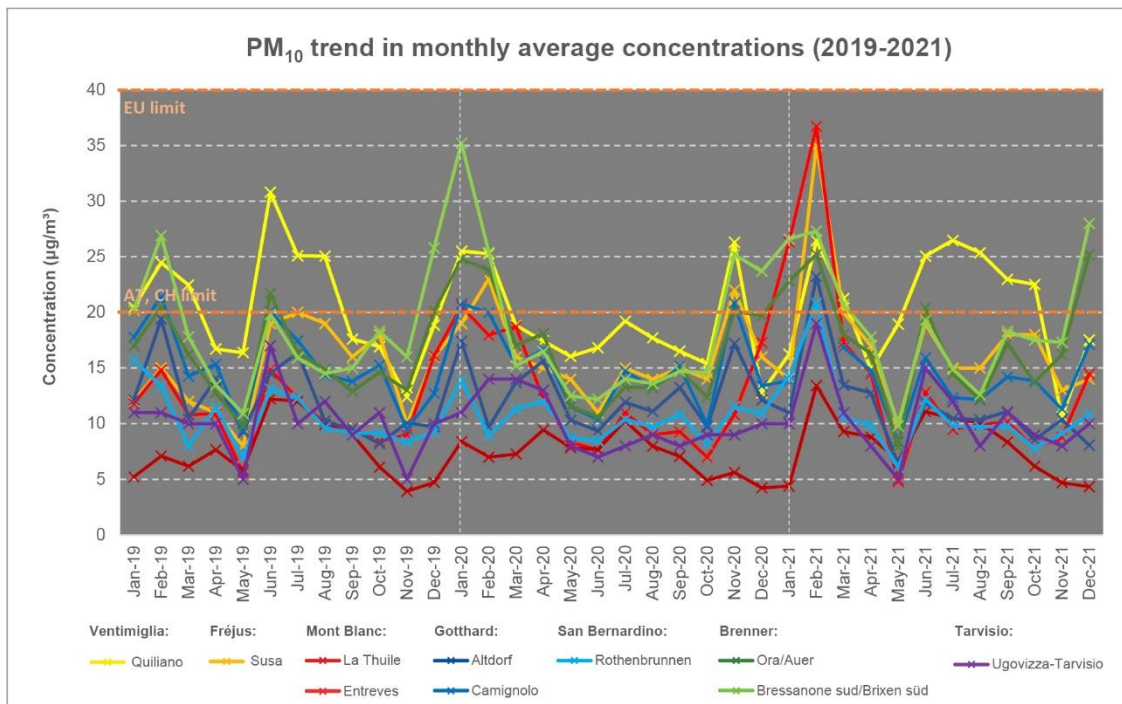


Figure 20: PM₁₀ trend in monthly average concentrations for 2019-2021
MAIN INSIGHTS: Similarly to NO₂ concentrations, the monthly trend in 2021 is closer to 2019, showing a rebound compared to 2020 (first Covid-19 pandemic year).

Data for the year 2019 shows three main peaks for most corridors in February, June and December respectively. Conversely, values tend to decrease from March to May 2019, as well as from July to November 2019. As for NO₂ concentration, even for PM₁₀ the same trend is not visible in 2020. After the peak registered in January 2020, values tend to steadily decrease until October

2020 (although there is a little rebound in July 2020 for all corridors). A second peak is then reached in November 2020, especially for the measurement stations along Ventimiglia, Fréjus, Brenner, Gotthard and San Bernardino. In 2021, the values are once again closer to the ones registered in 2019: there are three main peaks for most corridors in February, June/July and December, confirming a partial re-increase to the pre-pandemic condition. Differences and similarities between 2019, 2020 and 2021 are visible especially when comparing values registered in June and August for the three years. Between 2020 and 2019, the decreases registered in June and August were on average of 44.1% and 12.6%. Between 2021 and 2019, the differences are smaller, with average registered decreases of 10.8% and 9.8% in June and August 2021 compared to the same months of 2019.

Indicator “Noise”

(1) Noise has been measured through the indicators L_{den} and L_{night} . The former defines the overall level registered during the day, evening and night and is used to describe the general annoyance caused by noise. The latter is the indicator for sound levels during the night and it is used to describe sleep disturbance. Figure 21:21 and Figure 22:22 show that in 2021, L_{den} lies in the range between the 79.9 dB(A) and 69.0 dB(A), while L_{night} lies between the 72.4 dB(A) and the 60.9 dB(A). As in previous years, the highest value for both cases was registered at Reiden and the lowest at Châtillon.

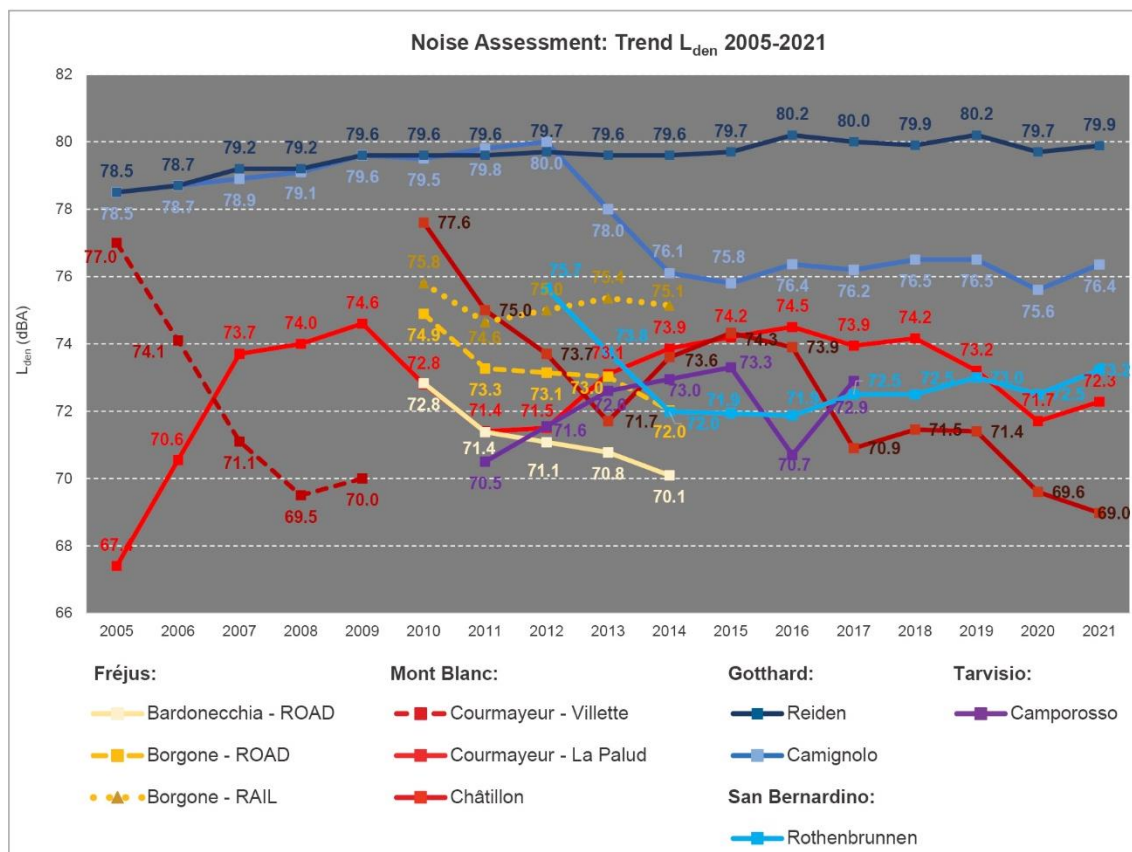


Figure 21: Daily average noise levels L_{den} trend⁶

MAIN INSIGHTS: Similarly to air pollutant concentrations, rebounds in the period 2020-2021 are also visible for noise.

⁶ Data for Courmayeur – La Palud (year 2006), Bardonecchia and Campososso (year 2012) is not available. The average value between the previous and the following year has been considered.

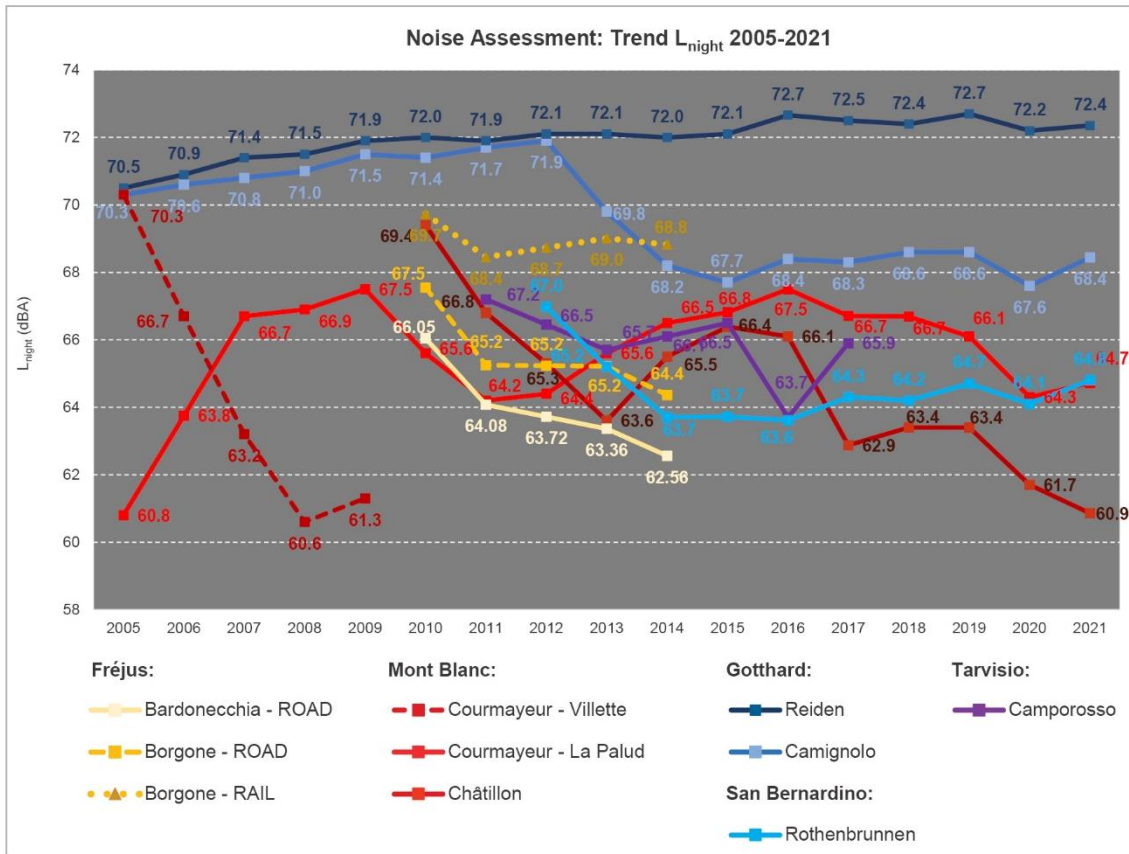


Figure 22: Average noise levels during night L_{night} trend⁷

MAIN INSIGHTS: Similarly to air pollutant concentrations, rebounds in the period 2020-2021 are also visible for noise.

According to the restrictions posed by the COVID-19 pandemic, all measurement stations register noise reductions in 2020 compared to 2019, which range between -2.5% and -0.6% for L_{den} , and between -2.7% and -0.7% for L_{night} . Specifically, the highest reductions are registered in Courmayeur-La Palud (-2.0% for L_{den} and -2.7% for L_{night}) and Courmayeur-Villette (-2.5% for L_{den} and -2.7% for L_{night}). Intermediate values regard the measuring station of Camignolo since a reduction of 1.2% and 1.5% is registered for L_{den} and L_{night} . Finally, smallest reductions are visible in Rothenbrunnen (-0.7% for L_{den} and -0.9% for L_{night}) and Reiden (-0.6% for L_{den} and -0.7% for L_{night}). In 2021, data has increased again compared to 2020 for all measuring stations (+0.7% for L_{den} and +0.9% for L_{night} on average), with the only exception of Châtillon (-0.9% for L_{den} and -1.4% for L_{night}). The highest increases compared to 2020 are registered in Reiden and Rothenbrunnen for L_{den} (both +1.0%), as well as in Camignolo and Rothenbrunnen for L_{night} (+1.2% and +1.1% respectively).

Indicator “Toll prices”

(1) **Toll prices** are calculated as the distance between the entering and exiting toll stations of localities that are situated along the transalpine axis under evaluation and that are relevant nodes of the infrastructural network. The assessment is performed for the passage of a standard passenger car and three standard heavy duty vehicles of 5 axles and 40 t, with a distinction between

⁷ Data for Courmayeur – La Palud (year 2006), Bardonecchia and Camporosso (year 2012) is not available. The average value between the previous and the following year has been considered.

EURO-classes II, V and VI. The sums for the alpine passages for the year 2021 are visible in Figure 23.

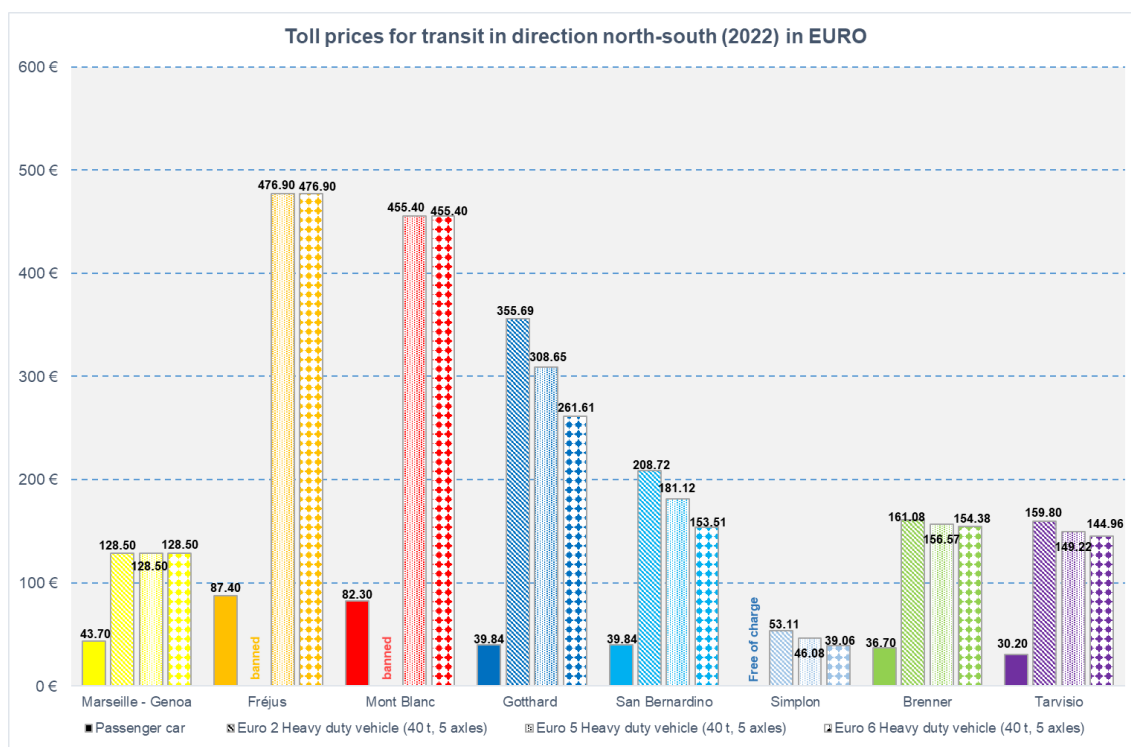


Figure 23: Toll Prices for a single transit on the iMONITRAF! corridors in direction North-South
MAIN INSIGHTS: Similarly to the previous years, considerable differences along the transit axis are visible. The corridors with the longest road basis tunnel are those with the highest toll prices.

For **passenger cars**, the highest charges are applied for the Fréjus and Mont Blanc corridors (€ 87.40 and € 82.30 respectively). Here, apart from the highway tolls, the additional tunnel tolls are responsible for the high overall sum compared to the other corridors. It is also important to point out that the tunnel tolls on the Fréjus and the Mont Blanc differ according to the direction of travel, due to the different VAT applied: they are higher when travelling from Italy to France (€ 48.80 instead of € 48.00 in the opposite direction). With € 43.70, € 39.84 and € 36.70, the charges for Ventimiglia, the Swiss highways and Brenner are in the midrange of the corridors, while the costs for a passage on Tarvisio are the lowest (€ 30.02).

Charges have increased for all corridors from 2021 to 2022. Major increases are registered for the Swiss corridors because of the changes in the EUR/CHF exchange rate (+3.48%), as well as for Fréjus and Mont Blanc (+2.48% and +2.82%), mid-range increases affect Tarvisio (+2.03%). Finally, minor variations are visible for Brenner and Ventimiglia (+1.66% and +1.63%). This overall increase of charges relates to the conclusion of inspection and maintenance works along various highway network sections in Liguria as well as to an overall increase in prices affecting all involved countries. Finally, it is important to highlight that the Simplon corridor is free of charge for passenger cars: indeed, the highway A26 ends in Gravellona Toce, and to reach the national border, a state road (SS 33) is available, and for the Swiss part, the Vignette is not due. Data referred to this corridor has been fine-tuned and is not comparable with reports before 2020.

For **heavy duty vehicles**, road tolls follow the similar West-East-divide as for passenger cars. Fréjus and Mont Blanc charge the highest tolls, while Gotthard and San Bernardino charge medium-ranged sums. Leaving aside Simplon (of which the distance is considerably shorter than

that of the other corridors), Ventimiglia, Tarvisio and Brenner charge the lowest tolls for a passage. Different than for light vehicles, German highways are not free of charge for heavy vehicles, so this component concurs in defining the tolls along the Brenner corridor. As opposed to Switzerland, Germany and Austria, the Italian and French toll systems have not yet applied a distinction of charges between single emission classes. For instance, at Ventimiglia, the toll for EURO II and EURO VI is the same (€ 128.50). In 2022, an increase of prices has been registered as compared to 2021 for most corridors apart from the Brenner (registering a decrease between 0.48% and 0.35% depending on the EURO classes). Major differences are visible for the Swiss corridors, Mont Blanc and Fréjus. For the Swiss corridors, tolls have increased by 8.63% (also because of the increase in the EUR/CHF exchange rate). For Mont Blanc, tolls have increased by 3.14% for EURO V and VI heavy vehicles. For Fréjus, the increase is of 2.66% for the same classes. Less relevant increases are registered along Ventimiglia, where tolls have increased by 1.34% for all categories of heavy vehicles. Finally, Tarvisio registers the smallest positive variations (between 1.09% and 1.36% depending on the EURO classes).

The toll of the Italian part of the Brenner corridor (from Brenner to Verona) is € 40.20 for each EURO class. On the contrary, the German and Austrian systems (from Munich to Kufstein and from Kufstein to Brenner) introduced tolls that are differentiated according to EURO classes. In Germany, tolls are € 20.41 for EURO II, € 15.91 for EURO V HDVs and € 15.01 for a EURO VI HDV; in Austria, € 100.46 for EURO II and V HDVs, € 99.17 for a EURO VI HDV. This explains the slight difference visible in Figure 23. The biggest difference among EURO classes is visible at Mont Blanc and Fréjus, where EURO II vehicles are not allowed to circulate. A further analogy with the situation of passenger cars is that the tunnel tolls on Fréjus and Mont Blanc differ according to the direction of travel for heavy duty vehicles: due to the different VAT, the charge is higher when travelling from Italy to France (€ 355.70 compared to € 349.80 for a EURO V or EURO VI truck at Fréjus and Mont Blanc). Finally, along the Gotthard corridor, a EURO V truck pays € 286.93, about 87% of the charge of a EURO II vehicle (€ 330.67). This percentage further lowers to 73% when EURO VI (€ 243.20) and EURO II trucks are compared.

(2) This analysis shows the absolute costs of selected trips. For freight forwarders, the **distance-specific costs – costs per vehicle kilometre** – are another important criterion for choosing the most convenient corridor and transport mode. To this aim, Figure 24:24 shows the specific costs by dividing the absolute costs presented in Figure 23 by the number of kilometres for each corridor, as expressed at the beginning of this section. The order of corridors from highest to lowest costs remains similar to absolute costs.

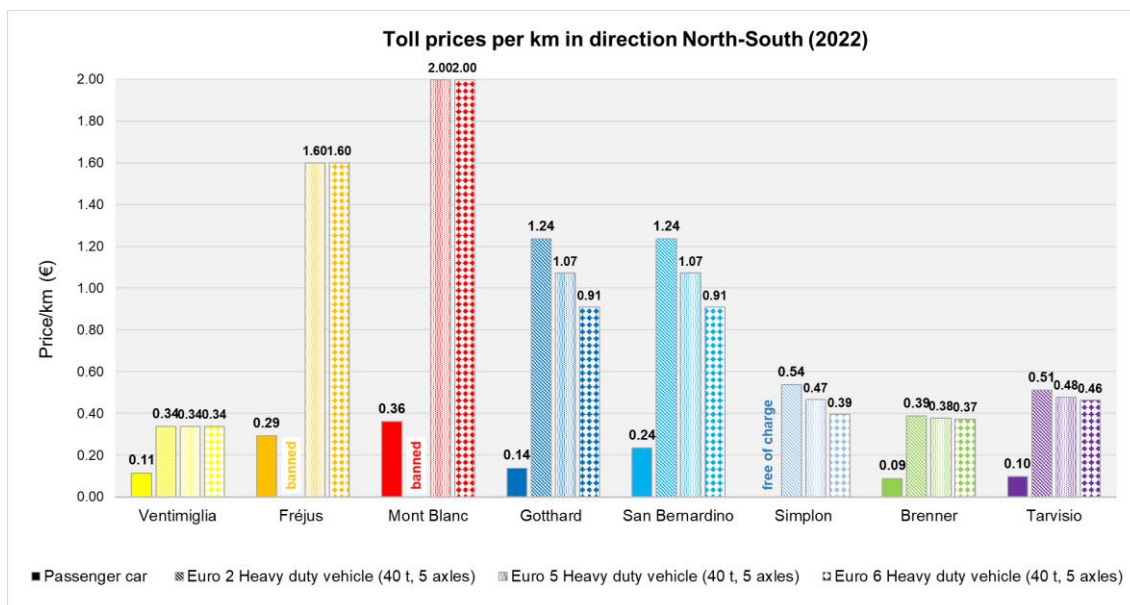


Figure 24: Distance-specific toll prices (€/km) for a transit on the iMONITRAF! corridors (direction North-South)

MAIN INSIGHTS: Overall differences among corridors are reflected by the kilometric toll prices. Generally, corridors with high kilometric toll prices tend to have small traffic volumes and vice versa.

If we consider a heavy vehicle with EURO VI technology and 40 t, specific toll prices are the highest at Fréjus and at Mont Blanc (€ 2.00/veh-km and € 1.60/veh-km), they lie in the middle for Swiss corridors (€ 0.91/veh-km at Gotthard and San Bernardino) and are the lowest at Tarvisio (€ 0.46/veh-km), Brenner (€ 0.37/veh-km), Simplon (€ 0.39/veh-km), and Ventimiglia (€ 0.34/veh-km). Compared to the annual report 2021, these values are slightly higher (between 1 and 7 Eurocents per km) for almost all corridors, apart from Brenner (unchanged). A general feature of absolute and specific costs is that high tolls correlate with low traffic volumes and vice versa: recalling Figure 67 and Figure 8, Fréjus and Mont Blanc have high tolls and low traffic volumes, while Brenner, Ventimiglia and Tarvisio have lower costs and higher traffic volumes.

Indicator "Fuel price"

(1) This indicator monitors the **average prices of diesel and petrol** (normal petrol) at the national level in Austria, France, Italy, Switzerland and Germany. The values shown in Figure 2525 are the annual averages of the values officially registered in every country on four days in all seasons (15th Jan, May, Jul, Oct). Data is provided by ÖAMTC for Austria, the Federal Statistical Office for Switzerland SFSO, ISTAT for Italy, INSEE for France and ADAC for Germany. Average prices in 2022 were € 1.89 for diesel and € 1.84 for petrol (strongly increasing compared to 2021).

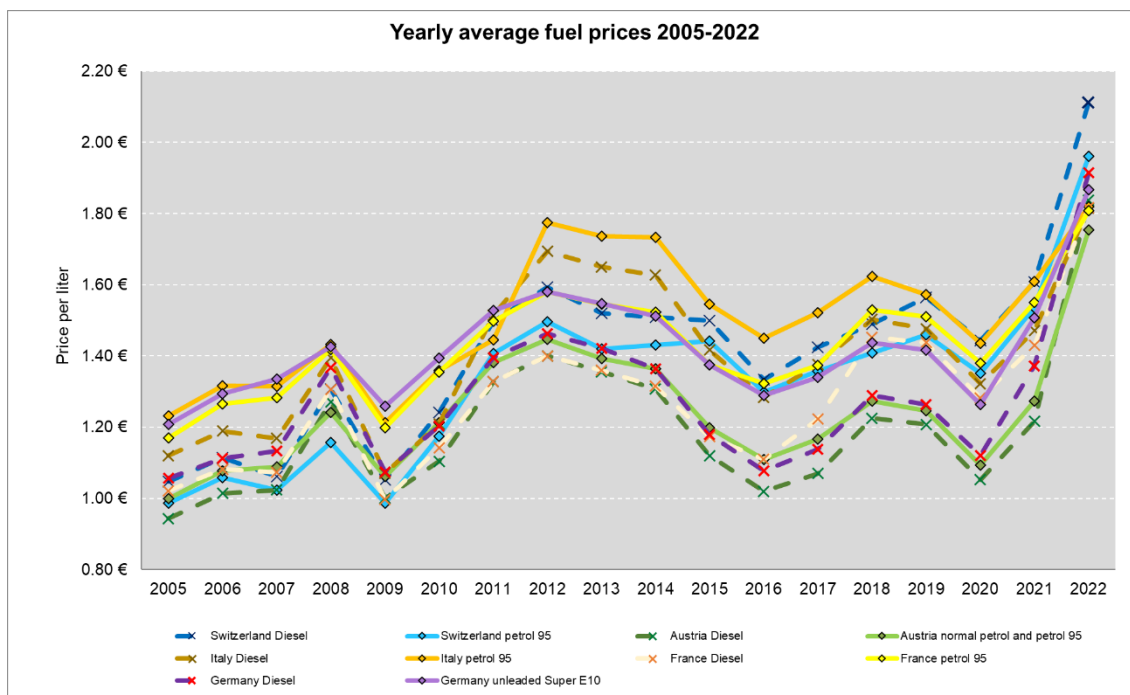


Figure 25: Annual average fuel prices in € per litre.

MAIN INSIGHTS: Considerable increase in 2022 for all countries and fuel types due to Ukraine crisis.

In comparison to 2005, an overall increase of prices happened in all countries, but with a significant fluctuation during the economic crisis of 2008 and 2009. From 2009 onwards, there has been a strong increasing trend until 2012, followed by a decrease in all countries for the years 2013-2016. The decrease is particularly relevant between 2014 and 2016 for Italy, France and Austria and can be explained by the drastic plunge in prices of crude oil. In Switzerland, the decrease seems less marked (diesel) or even in countertrends (petrol). However, this result must be interpreted by considering the unit of measure selected for our analysis (€) and the financial policies adopted by the Swiss National Bank, which in January 2015 decided to discontinue the minimum exchange rate of CHF 1.20 per Euro and to lower the interest rate. If the costs of petrol and diesel in Switzerland were expressed in CHF, the time series would show the same features as those in the other countries, the value for 2015 would be about 15% lower than in 2014. After four years of decreasing prices, 2017 and 2018 show a general increase, which has led to the levels of the year 2015. For 2019, a slight reduction of prices is recognised except for Switzerland. Again, if the variation of the exchange rate is accounted⁸, the trend is the same as in the other countries in this case, too. In 2020, a relevant decrease of prices is registered for all countries as compared to 2019 (about -9% for diesel and -10% for petrol, refer to footnote 5). This is linked to the crisis caused by the COVID-19 pandemic in spring 2020, which has led EU countries to introduce strong mobility restrictions. In turn, these restrictions have caused a fall in fuel prices. In 2021, a significant increase of fuel prices has been registered in all countries (ca +15% on average), in relation with the increase in prices of crude matters, which has involved the European energy sector as a whole. This increase has affected all observed countries to a similar extent. In Switzerland, diesel and petrol 95 values have increased by 11% and 14% respectively. In Austria, they have increased by 16% for both diesel and petrol 95. In Italy, +11% and +12% variations have been

⁸ Exchange rate EUR/CHF 2017: 1.111, 2018: 1.155, 2019: 1.112, 2020: 1.078, 2021: 1.081, 2022: 1.005 (<https://www.estv.admin.ch/estv/de/home/direkte-bundessteuer/wehrpflichtersatzabgabe/dienstleistungen/jahresmittelkurse.html>)

registered. In France, the increase has been of 12% for both diesel and petrol. Finally, in Germany the increase has been of 22% and 19%. In particular, it is worth mentioning that the values registered on 15th Oct 2021, have been the highest ever registered in iMONITRAF! in the last five years in Switzerland, Austria, Italy, France and Germany. With the beginning of the war in Ukraine in February 2022, the escalation of fuel prices has strongly increased (even despite the measures introduced by various countries). Overall, the diesel and petrol 95 prices have increased by 34% and 23% in 2022 compared to 2021. These increases have been mostly registered from May 2022 and have most strongly affected Austria, Germany and Switzerland. In particular, diesel and petrol 95 prices have increased in Austria by 51% and 38% respectively in the period 2021-2022. Conversely, Italy shows the lowest variations (+23% and +13% for Diesel and Petrol 95), also according to the national (fiscal) measures introduced to limit the increase of prices.

Indicator “Alternative Fuels per corridor”

(1) This indicator shows the **recharging stations for electric vehicles (EVs)** and the **service stations providing alternative fuels** (hydrogen, LNG, CNG, LPG⁹) along the iMONITRAF! corridors (using the same origins and destinations described in the indicator related to toll prices). Figure 26:26 illustrates the AFs stations per corridor in both directions (North-South and South-North), available in 2022.

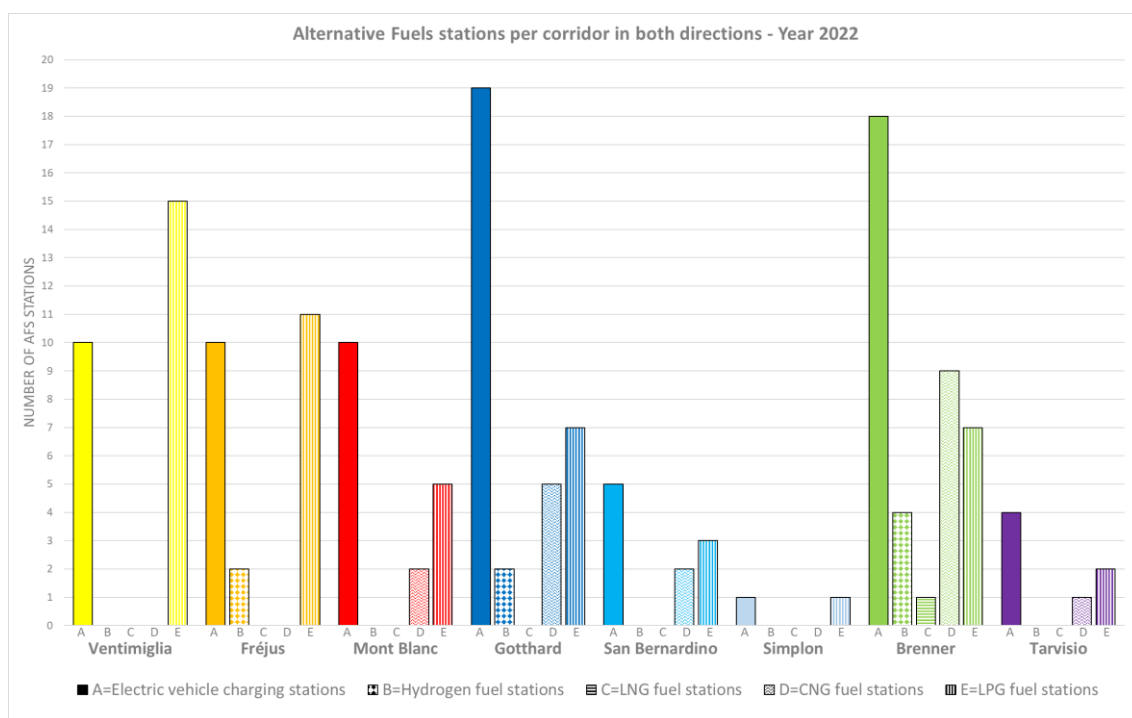


Figure 26: AFs stations per corridor in both directions (North-South and South-North) – year 2022

MAIN INSIGHTS: Considerable infrastructures available for electric vehicles, low density for hydrogen.

EV charging stations include different types of charging points of which quantification is beyond the limit of this analysis. With 19 and 18 stations, the Gotthard and Brenner corridor reveals the highest number of EV charging stations, followed by Ventimiglia, Fréjus and Mont Blanc (all 10). Compared to 2021, the number of electric recharging stations have increased for Gotthard only

⁹ LNG: liquefied natural gas, CNG: compressed natural gas, LPG: liquefied petroleum gas

(+2). The other corridors have maintained the same values of 2021. LPG also has filling stations at each corridor. The highest numbers were recorded along the FR-IT corridors of Ventimiglia (15 stations) and Fréjus (11 stations). Concerning the hydrogen fuel stations, only three out of eight corridors offer the possibility of recharging vehicles: Brenner, Fréjus and since 2021 also Gotthard. Regarding LNG fuel stations, only one station located at the autoport of Sadobre (Italian side of the Brenner corridor) is available. Finally, existing stations for CNG are mainly located along the Brenner and Gotthard corridors (9 and 5 stations, respectively).

Indicator “Unitary pricing components”

This indicator includes taxes to be paid for the purchase and ownership of vehicles¹⁰, which play an important role in influencing the modal and vehicle choices of users (e.g. in purchasing an electric rather than petrol car). They include the *purchase tax*, *registration tax*, *ownership tax* and *insurance tax*.

(1) In 2022, the **purchase tax** (VAT) is applied to all vehicle types and amounts to 20% in France, 7.7% in Switzerland, 22% in Italy, 20% in Austria and 19% in Germany. It is totally deductible for commercial vehicles for the transport of goods (except in Switzerland). In Austria, the same tax deduction is applicable for zero-emission passenger cars since 2016. From 2016 to 2021 the tax values have remained almost unchanged. Just one variation can be mentioned: the decrease from 8% to 7.7% in Switzerland between 2017 and 2018.

(2) In 2022, the **registration tax** (Figure 27:27) is calculated in different ways across countries. In Switzerland, Austria and Germany, a fixed amount is applied to all vehicles. It is equal to about € 120 in Switzerland, € 196 in Austria, and € 26 in Germany. In contrast, in France and Italy the tax changes depending on the type of vehicle. In France, a EURO VI petrol car has a registration tax of approx. € 146. This depends on the “*puissance fiscale*” (fiscal power) of the vehicle, the regional tax, the CO₂ bonus/malus and the registration supplement. When considering an electric car, the tax drops to approx. € 14 since only the registration supplement is taken into account for EVs. As for the HGV, the registration tax amounts to approx. € 761 for a diesel EURO VI HGV and to € 299 for an electric HGV. In Italy, the registration tax differs between petrol and electric cars (€ 346 against € 607), while the amount is the same for diesel and electric HGV (€ 991). The tax is calculated on the basis of a fixed national registration fee; an “*Imposta Provinciale di Trascrizione*” (provincial transcription fee) that varies depending on the type of vehicle and its engine power in kW; and a percentage increase applicable by each province. Over the last six years, the registration tax has slightly changed in France, Austria and Italy. In 2022 specifically, it increased only in Austria, passing from € 193.50 to € 195.50.

¹⁰ The main sources used for data concerning the pricing components are the ACEA Tax Guide. See as example the 2021 report: https://www.acea.auto/files/ACEA_Tax_Guide_2021.pdf. Additional sources are used for each country.

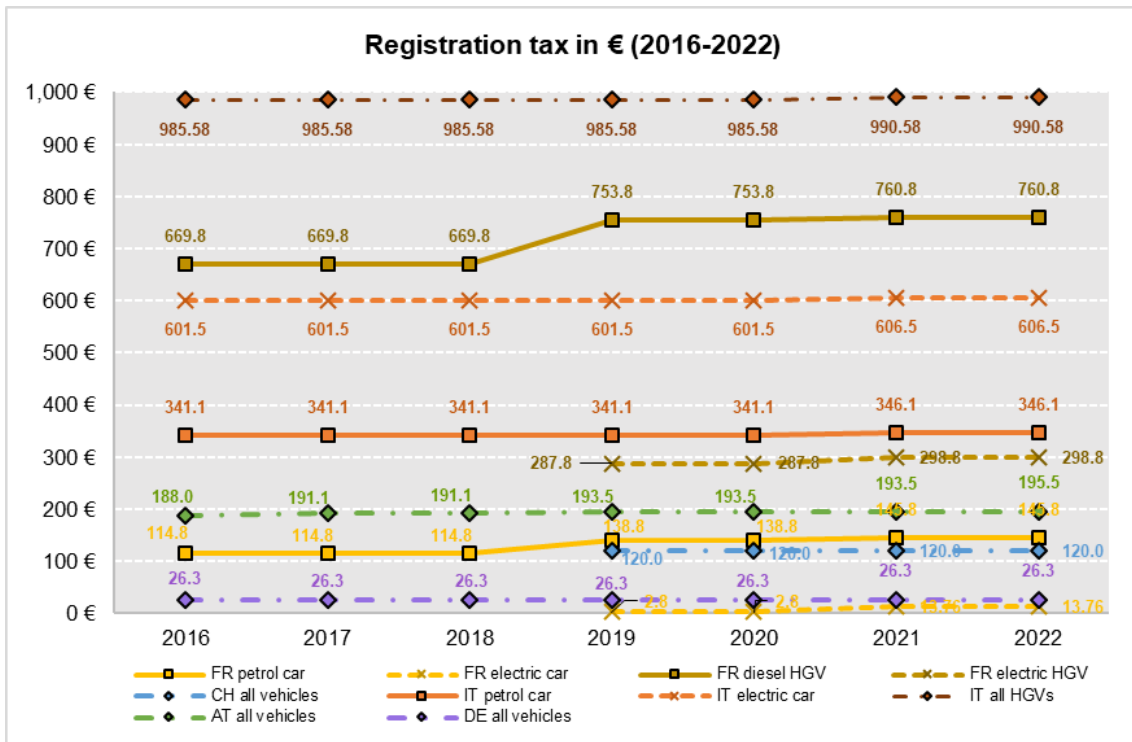


Figure 27: Registration tax to be paid *una tantum* with the purchase of a vehicle (2016-2021)

MAIN INSIGHTS: While some countries apply the same tax to all the considered vehicle types (Austria, Switzerland and Germany), others apply relevant differentiations (France and Italy).

(3) The **ownership tax** is calculated with similar approaches across countries. As visible in Figure 28: 28, it significantly differs between passenger cars and HGVs. For a petrol EURO VI car, it is € 0 in France, € 140 in Switzerland, € 124 in Italy, € 179 in Austria and € 46 in Germany. For a diesel EURO VI HGV it is € 364 in France, € 2,455 in Switzerland, € 674 in Italy, € 912 in Austria and € 556 in Germany. Furthermore, except for France, there are relevant differences between vehicles using fossil and alternative fuels. As for passenger electric cars, the tax is not due in France, Italy, Austria and Germany. In Italy and Germany, this exemption applies respectively to the first five or ten years after vehicle registration. In Switzerland, the tax is lower for electric cars than for petrol ones (€ 103 against € 140). Also for electric HGVs, the ownership tax is not due in Switzerland, Italy and Austria, while amounting to € 278 in Germany (rather than € 556 paid for diesel EURO VI HGVs). Values in each country did not change between 2016 and 2022.

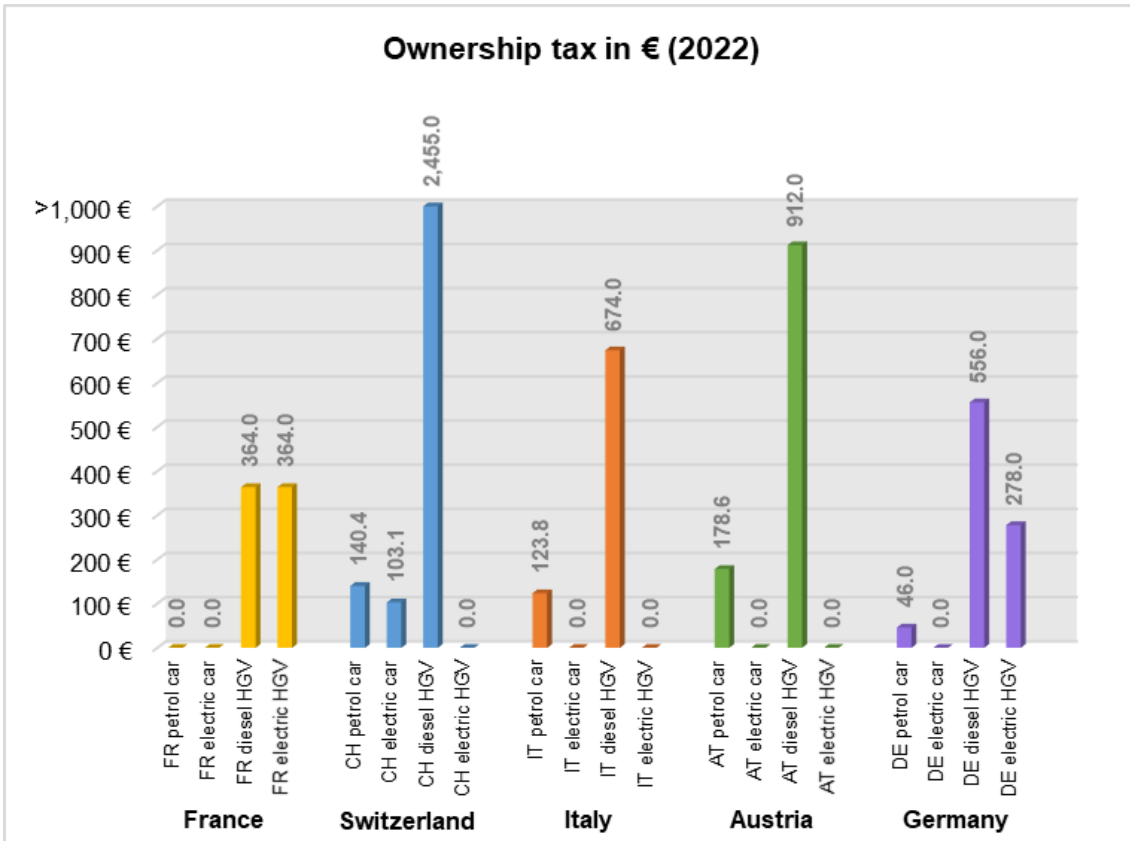


Figure 28: Annual registration tax to be paid for different types of cars and HGVs.

MAIN INSIGHTS: Generally, countries apply a high ownership tax to diesel HGVs, while it strongly decreases (or is zeroed) for electric HGVs (the only exceptions regard France and Germany).

(4) Similarly to the purchase tax, the **insurance tax** is also applied in each country in the same way to all types of vehicles. It is 33% of the insurance cost in France, 7.7% in Switzerland, 29% in Italy, 11% in Austria and 29% in Germany (2022). The only exception concerns France, where a share of 33% is applied to passenger cars while a reduced value of 15% is applied to commercial vehicles with a total permissible laden weight above 3.5t. These values have been unchanged from 2016 onwards.

5.2 Methodological explanation of the monitoring indicators

Indicator “Road traffic volumes”

Road traffic volumes can be measured in different ways, according to the measuring stations and the counting systems considered. Regarding the **measuring stations**, for Fréjus, Mont Blanc, San Bernardino and Gotthard data is taken from the stations at the entrance of the tunnels. For Brenner and Tarvisio, the data series stem from the Austrian stations of Brennersee and Maglern, which are the closest toll stations to the Italian-Austrian border. Finally, for Ventimiglia, the Italian toll station of Ventimiglia (that is the closest to the FR-IT border) has been considered. Regarding the **counting systems**, Brenner and Tarvisio adopt the Austrian classification for road detection, as provided by ASFiNAG: all vehicles below 3.5 t are counted as light vehicles, whereas those above 3.5 t are classified as heavy vehicles. For Swiss corridors, the official classification adopted by the Federal Office of Transport (FOT) has been considered: vehicles belonging to classes 1-3 (passenger cars, motorcycles and light commercial vehicles) are counted as light vehicles; those

belonging to classes 4-7 (buses, coaches, HDV trucks, HDV truck trailers and HDV articulated trucks) as heavy vehicles. Finally, vehicles along Italian-French corridors are reckoned according to the system used by the Italian highways: the light vehicle category consists of vehicles belonging to class A (height below 1.3 m), while the heavy vehicle category includes those means belonging to class B (height above 1.3 m) and classes 3, 4, 5 (according to the number of axles).

Indicator “Road traffic volumes” – Monthly data 2019-2021

To investigate in more detail the impacts of the COVID-19 pandemic on the road traffic volumes along the iMONITRAF! corridors, monthly data have been collected from the same sources used to complete annual data. This ensures consistency between annual and monthly values and allows providing more details on the fluctuation of road traffic flows in the years 2019 (pre-COVID condition), 2020 and 2021 (first and second year of COVID-19 pandemic).

Indicator “Transalpine freight transport rail and road”

The analysis of the tons transported per year is largely affected by the difficulties in finding reliable and consistent data. However, thanks to the information collected and provided by the Swiss Federal Office of Transport - Observatory for Road and Rail Freight Traffic in the Alpine Region (France, Switzerland, Austria; FOT 2022¹¹), data for all corridors has been collected until 2021.

Indicator “Transalpine freight transport rail and road” – Monthly data 2019-2021

Also the analysis of the tons transported per month during the years 2019-2021 is largely affected by the difficulties in finding reliable and consistent data. Even in this case, the information collected by the Swiss Federal Office of Transport - Observatory for Road and Rail Freight Traffic in the Alpine Region (France, Switzerland, Austria), has allowed the collection and analysis of such data.

Indicator “Air pollution concentrations measured”

Some details regarding the measurement stations have to be mentioned. First, the South Tyrolean station of Velturno/Feldthurns was deactivated at the end of 2016 and the station of Bressanone sud/Brixen süd (located 1.5 km northward from Velturno/Feldthurns, south of Bressanone/Brixen) has replaced it since 2018. South Tyrol is thus described by the stations of Velturno/Feldthurns (years 2005-2016), Bressanone sud/Brixen süd (years 2018-2021) and Ora/Auer (years 2007-2021). Second, since NO₂ is not monitored at Tolmezzo since 2019, it is flanked with the station of Ugovizza-Tarvisio. This station was activated at the end of 2014 and data is available from 2015. Finally, data for the station of Vallée de la Maurienne is not available since 2019 and from that moment replaced by Maurienne Trafic, while data of Chamonix Bossons (Mont Blanc) is not available for 2020 and 2021.

Indicator “Air pollution concentrations measured” – Monthly data 2019-2020

It has been possible to collect monthly data only for some of the measurement stations considered in the annual analysis. Specifically, monthly data are available for the stations of Quiliano (Ventimiglia), Susa (Fréjus), Rothenbrunnen (San Bernardino), Ugovizza-Tarvisio (Tarvisio), La Thuile and Entreves (Mont Blanc), Altdorf and Camignolo (Gotthard), and Ora/Auer and Bressanone Sud/Brixen Süd (Brenner).

¹¹ FOT 2022. *Observation and analysis of transalpine freight traffic flows, Key figures 2021*. The report will be available in the second half of 2022. It will be available online at: <https://www.bav.admin.ch/bav/de/home/verkehrsmittel/eisenbahn/gueterverkehr/verlagerung/berichte-und-zahlen.html> (German language version).

Indicator “Noise”

A comparison between the values (**L_{den}** and **L_{night}**) registered in different corridors may be not appropriate due to different distances between the microphones and the streets. However, the variations along the individual corridors are consistent throughout the years. Gotthard and Mont Blanc are the only corridors with continuous data collection for the period 2005-2020 (measuring stations of Camignolo, Reiden and Courmayeur), whereas noise is not monitored along Brenner and Ventimiglia. Only partial data is available along San Bernardino (Rothenbrunnen), Tarvisio (Camporosso), Fréjus (Bardonecchia) and Mont Blanc (Châtillon). Regarding the first station, data collection started in 2012 and is currently ongoing; in Camporosso and Bardonecchia, updated values are not available: the monitoring period was limited to 2011-2017 in the former case and to 2010-2014 in the latter. In Châtillon, data collection is available for 2010-2021.

Indicator “Toll prices”

The origins and destinations for the calculation of toll prices have been defined as follows:

- Ventimiglia: from Marseille (FR) to Genova (IT) via Ventimiglia (381 km)
- Fréjus: from Lyon (FR) to Torino (IT) via Fréjus road tunnel (298 km)
- Mont Blanc: from Bellegarde-sur-Valserine (FR) to Ivrea (IT) via Mont Blanc road tunnel (228 km)
- Simplon: from Brig (CH) to Gravelona Toce (IT), via Simplon pass (99 km)
- Gotthard: from Basel (CH) to Chiasso (CH) via Gotthard road tunnel (288 km)
- San Bernardino: from Chur (CH) to Chiasso (CH) via San Bernardino road tunnel (169 km)
- Brenner: from Munich (DE) to Verona (IT) via Brenner pass (415 km)
- Tarvisio: from Salzburg (AT) to Udine Nord (IT) via Villach (313 km)

The calculated prices refer to the prices for a single passage (in direction north-south). This holds for the Fréjus and Mont Blanc tunnels, the Austrian highway vignette and the separate Brenner highway toll on the A13 in Austria as well as for the Swiss highway toll (passenger cars). For these corridors, return tickets and yearly subscriptions are also available, which would lower the cost for a single passage. For Switzerland, only a yearly ticket is available for passenger cars, meaning that only the first passage costs, while all subsequent passages within the same year are free.

Indicator “Alternative Fuels per corridor”

The EU transport sector still heavily relies on fossil fuels. In particular, road transport accounts for the largest share of oil-derived fuels and was responsible for 71% of total EU energy consumption in 2017¹². In this framework, the diffusion of sustainable fuels and renewable energy sources is highly encouraged by the EU¹³. Alternative fuels (AFs), by alleviating the dependence on fossil fuels, have prominent advantages for reducing the emission of greenhouse gases (GHG) and air pollutants. However, their use requires the development of adequate AF charging infrastructures. For each corridor, the AFs stations located in the service areas and in the parking areas of the toll gates as well as those stations located in the autoports and at the entrance/exit of the road tunnels are identified. The only exception is made for hydrogen: due to its limited diffusion, the stations located close to the road corridors have also been included. The main source for data

¹² *European Environment Agency, 2020*. Transport, increasing oil consumption and greenhouse gas emissions hamper EU progress towards environment and climate objectives. Online at: <https://op.europa.eu/it/publication-detail/-/publication/20388700-577f-11ea-8b81-01aa75ed71a1/language-en/format-PDF>

¹³ DIRECTIVE 2014/94/EU of the European parliament and of the council of 22 October 2014 on the deployment of alternative fuels infrastructure. Online at: <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32014L0094>

collection is the European alternative fuel station map¹⁴, which has been integrated in other web-platforms at national and international level.

Indicator “Unitary pricing components”

Four unitary pricing components are observed for the years for France¹⁵, Switzerland¹⁶, Italy, Austria and Germany¹⁷:

- the *purchase tax*, expressed in % of the one-only purchase cost of vehicle (equals value added tax, VAT);
- the *registration tax*, expressed in Euros, to be paid one time only with the purchase of vehicle;
- the *ownership tax*, expressed in Euros, to be paid yearly;
- the *insurance tax*, expressed in % of the yearly insurance costs.

In France, Switzerland and Italy, the unitary pricing components vary from region to region. Therefore, sample regions are considered: the department of Oise for France, Ticino for Switzerland, Lombardy for Italy. Additionally, the unitary pricing components depend on the type of vehicle considered. Therefore, four types of vehicles are selected: petrol EURO VI car (1030 kg, 1000 ccm, 48 kW and 108g CO₂/km); electric car (1540 kg, 100 kW and 0 g CO₂/km); diesel EURO VI HGV (40 t, 5 axels and 235 kW); electric HGV (40 t, 5 axles and 235 kW).

¹⁴ <https://www.eafo.eu/fuel-map>

¹⁵ Additional sources for France regard the online calculation of the registration tax. Available at: <https://www.service-public.fr/simulateur/calcul/cout-certificat-immatriculation>

¹⁶ Additional sources for Switzerland regard the online calculation of the registration tax. Available at: <https://www4.ti.ch/di/sc/veicoli-e-collaudi/immatricolazioni/immatricolazione-di-un-veicolo-nuovo/>

¹⁷ Additional sources for Germany regard the online calculation of the ownership tax. Available at: https://www.bundesfinanzministerium.de/Web/DE/Service/Apps_Rechner/KfzRechner/KfzRechner.html

6 Moving ahead on regional and national level: Update on Best Practices

6.1 Overview on revised and new Best Practices

Transport policy frameworks were further developed and optimised in all iMONITRAF! regions throughout the year 2022, as reported in the iMONITRAF! exchange on best practices. Developments took place in all five policy pillars (see table below) with a specific focus on the further development of control centers for road transport (enforcement), the further dynamic development and optimization of regulatory measures and incentive frameworks and a further “streamlining” of decarbonization efforts into public policy making. Also, infrastructure projects both for freight and passenger transport were further developed in 2022 with important milestones for the Brenner Base Tunnel and the opening of several mobility centres in the iMONITRAF! regions which support high-quality multimodal passenger transport.

OVERVIEW: BEST PRACTICE UPDATE 2022

Policy Pillar	Name of measure	Country/region
Pillar 1: Monitoring, Information & awareness raising	New HGV control centre next to the toll station of Vipiteno/Sterzing on the Brenner motorway	Autonomous Province of Bolzano
	New permanent noise measuring station along Brenner railway line	Autonomous Province of Bolzano
	New measurement technologies for the inspection of particle filters of passenger cars	Switzerland
	Monitoring of the NEAT impacts on the Gotthard corridor	Switzerland
Pillar 2: Limiting negative impacts of Alpine transport	Public procurement contracts with more ambitious sustainability criteria (transport services)	Canton of Uri
	Extension of Euroclass driving ban to regional transport	Tyrol
	Extension of sectoral driving ban to regional transport	Tyrol
	Dosing system for HGV in Kufstein	Tyrol
	Construction of additional noise barriers along the Brenner railway line and motorway A22	Autonomous Province of Trento
Pillar 3: Modal Shift	Modal shift policy mix and CT	
	Launch of revision process on future modal shift policy mix, especially regarding the role of single wagon load transport	Switzerland
	Support measures and subsidy system for CT (continuation of financing)	Autonomous Province of Bolzano, Autonomous Province of Trento
	Infrastructure	
	Extension of rail services on finalized 4m corridor	Switzerland
	Monitoring of the NEAT impacts on the Gotthard corridor	Switzerland

OVERVIEW: BEST PRACTICE UPDATE 2022

Policy Pillar	Name of measure	Country/region
	Brenner Base Tunnel milestone: start of drilling at the construction lot "Sillschlucht-Pfons"	Tyrol
	Launch of construction works on the southern access routes	Autonomous Province of Bolzano, Autonomous Province of Trento
	Brenner Base Tunnel and southern access route: milestones	Tyrol, Autonomous Province of Bolzano, Autonomous Province of Trento
	Lyon-Turin railway link: construction work on French side	France
Pillar 4: Passenger transport	Promotion of cross-border public transport in SMISTO project (Sviluppo della mobilità integrata e sostenibile tra Ticino e Lombardia)	Ticino
	New intermodal passenger centres in Brixen/Bressanone and Bruneck/Brunico	Autonomous Province of Bolzano
	New mobility centre in Lienz	Tyrol
	New annual ticket for young people in Tyrol (KlimaTicket Tyrol U26)	Tyrol
	"Trial ticket": considerable reduced fares for monthly tickets in Tyrol to cushion the effects of increased energy prices and living costs	Tyrol
	Klima Ticket 2023: 10% discount on all Klima Tickets in Tyrol	Tyrol
	Agreement to continue "Euregio ticket students"	European Region Tyrol-South Tyrol-Trentino
	BINGO project for an integrated information and ticketing system of the South Tyrolean public transport	Autonomous Province of Bolzano
	Missing link between Brenner railway and Val Pusteria/Pustertal railway	Autonomous Province of Bolzano
	Extension of the cooperation agreement for the cross-border train connection Innsbruck-Forzezza/Franzensfeste-Lienz	Autonomous Province of Bolzano, Tyrol
	First provincial cycling plan	Autonomous Province of Bolzano
	New cycle lanes across two Alpine passes	Autonomous Province of Bolzano
	New cycle path connection between Pergine Valsugana and Trento	Autonomous Province of Trento
	Pilot project to manage road traffic in tourist hot spot at Lago di Braies/Pragser Wildsee	Autonomous Province of Bolzano
Optimized sustainable mobility planning in the Dolomites area (using innovative means of digitalisation)	Autonomous Province of Bolzano, Autonomous Province of Trento	

OVERVIEW: BEST PRACTICE UPDATE 2022

Policy Pillar	Name of measure	Country/region
	Bus Rapid Transit: development of a sustainable mobility system for the 2026 Olympic event:	Autonomous Province of Trento
	New hydrogen vehicles for public transport	Autonomous Province of Bolzano
	Decarbonisation strategy for public transport	Tyrol
	Electrification of local railway lines	Autonomous Province of Trento
Pillar 5: Innovative approaches	Proposal for a reservation system/slot-system for the Brenner corridor	Autonomous Province of Bolzano
	Platform for integrated mobility monitoring in Trentino along the Brenner axis	Autonomous Province of Trento

Table 3: Source: Compilation of the iMONITRAF! network

6.2 Best Practices per policy pillar

6.2.1 Pillar 1: Information, monitoring, awareness raising

Overall, monitoring campaigns are continued as in previous years and as summarised by the iMONITRAF! monitoring activities (see chapter 5).

The **enforcement of relevant environmental and social legislations** for road transport is further improved on the Alpine corridors. A new control station for HGV is currently developed on the Italian side of the Brenner corridor next to the toll station of Vipiteno/Sterzing in the Autonomous Province of Bolzano. In 2022, a relevant agreement has been signed by the management of A22 and the involved institutional partners. Also in Tyrol, it was agreed in September 2022 to expand the control centre in Radfeld both regarding human resources and infrastructure provisions.

Also, the monitoring system has been further developed in 2022. In the **Autonomous Province of Bolzano**, a new permanent noise measuring station has been installed at the railway station of Salorno/Salurn. It is the first **permanent noise measuring station** in South Tyrol and even in Italy. Railway Noise is measured automatically 24h/day and will provide data by an intelligent realtime data collection system. The project has been implemented by the Provincial agency for environment together with the municipality of Salorno/Salurn and the Italian railway infrastructure company RFI.

In Switzerland, the ordinance on the maintenance and follow-up inspection of motor vehicles with regard to exhaust and smoke emissions has been extended. With the beginning of 2023, motor vehicle inspection will use new measurement technology to check the particle filter systems of passenger vehicles.

Interesting insights on the traffic-related and spatial effects of the Gotthard axis as central element of the New Rail Link through the Alps (NRLA/NEAT) is provided by the ongoing project **“Monitoring Gotthard axis”**. The first reporting related to the first three years after opening of the BGT and is thus not influenced by the impacts of the COVID-19 pandemic. Regarding passenger transport, the monitoring report highlights that the reduced travel times have led to a significant

increase in rail passenger transport of 28%. This positive trend is reinforced by various measures to improve public transport, which are being promoted by the cantons of Ticino and Uri. Accordingly, the number of subscriptions and tickets sold increased in all regions. The improved rail connections on the Gotthard axis also helped to relieve the Gotthard motorway. Between 2016 and 2018, the number of passenger car journeys fell by four percent. The growth in rail traffic goes hand in hand with the development in overnight stays in Ticino.

Major impacts on the shift of heavy goods traffic from road to rail were not yet expected for this phase, since the Ceneri Base Tunnel and the continuous four-meter corridor were not yet in operation at the time of the analysis. A slight decrease in road traffic could be observed. However, due to the steady decline over the last 10 to 15 years, this is not surprising and is largely due to other measures, in particular the Heavy Vehicle Fee (HVF/LSVA). There are initial indications that the new base tunnel has also had a positive influence on spatial development. Bellinzona has benefited most from the improved accessibility. Here the population and employment - and consequently also real estate development - are higher than those in the Lugano region.

6.2.2 Pillar 2: Limiting impacts of Alpine transport

Pillar 2 deals with all regulatory measures that have the direct objective to limit negative impacts of transalpine freight transport, especially regarding air quality and noise. Especially along the Brenner corridor, pressures related to air pollution and congestion still remain high so that the existing set of regulatory measures was again optimized in 2022.

With a higher ambition on sustainability criteria, the **Canton of Uri showcases the role of public procurement** for the transition towards zero-emission transport. The entry into force of the new legislation on the tendering procedure for public bodies (regulating the procedure for awarding public supply, service and construction contracts) will take place on a cantonal basis. Compared to the old legislation, more weight is given to the criteria of sustainability. It can be observed that as a result, more contracts for transport services are awarded to companies that use electric trucks. This highlights an opportunity how Alpine regions can directly influence the composition of vehicle fleets within the framework of public services.

In **Tyrol**, the existing **set of driving bans** is further developed, especially regarding the removal of special provisions for regional transport. Up to the end of 2022, regional transport (origin and destination traffic) using EURO V vehicles was exempted from the Euroclass driving ban (as applied on the section Kufstein-Zirl). As with the beginning of 2023, the Euroclass driving ban thus ensures that only EURO VI vehicles are in operation on the Brenner motorway. Similarly, the sectoral driving ban along the A12 motorway between Langkampfen and Zirl (both directions) for all vehicles over 7.5 tons with transporting certain non-perishable goods is extended to EURO V also for regional transport as of 2023.

To avoid congestion on days with expected traffic peaks, Tyrol is continuing the **dosing system** (block admission system) at the border to Bavaria (in southern direction only). On selected days with expected traffic peaks in the morning, a cap of max. 300 HGV per hour is allowed to pass the checkpoint on the A12 motorway in Kufstein-Nord in the direction of Innsbruck. The dosing calendar for the first half year of 2023 was approved at a meeting of the regional government of Tyrol in August 2022, including 24 dosing days between January and June 2023. Further days can be scheduled due to weather and natural occurrences, accidents or reconstruction work.

Pillar 2 also includes measures related to **noise protection**. The **Autonomous Province of Trento** has implemented several new infrastructures in 2022. The project for the construction, renovation and extension of sound-absorbing barriers on the A22 Brenner motorway from km

134+578 to km 136+550 in the municipality of Trento (TN) is being approved by the Ministry of Infrastructure and Transport. The overall development of the barriers is equal to 3,532 m, of which 951 m represent the reconstruction of an existing barrier. Also, the construction of additional noise barriers on the railway line was agreed and 2023 will be dedicated to the design of new noise barriers in the Municipality of Trento, at Via Lavisotto, and in loc. Serravalle of Avio.

6.2.3 Pillar 3: Modal shift

Pillar 3 focuses on modal shift measures, including both push and pull measures. It includes policy measures related to modal shift, with a special focus on developments related to the common measures of the iMONITRAF! strategy as well as infrastructure measures.

Policy measures

Regarding the pricing measures, no major changes were reported in 2022. The systems for road charges were maintained unchanged, discussions on how to implement the new provisions of the Eurovignette are ongoing in the EU regions and in Switzerland the revision process of the HGV fee (LSVA) still needs to be finalized. Subsidies for combined transport were also continued in 2022, for example the subsidies for combined transport in the **Autonomous Province of Bolzano** was also provided in 2022. This subsidy focuses on the section Brenner-Salorno/Salorno-Brenner of the railway for Accompanied Combined Transport (ACT) or Unaccompanied Combined Transport (UCT) (similar to the years before).

Infrastructure measures and services

On the Gotthard corridor, the opening of the Ceneri Base tunnel and the completion of the 4 meter corridor and the enlargement of the railway station Altdorf, rail supply on the new infrastructures was further extended and optimized. The following changes were taken in operation in December 2021 and completed in 2022:

- Rail Freight Transport: services on the Gotthard corridor are extended to 6 tracks per hour and direction (two to/from Luino and four to/from Chiasso); the 4m corridor is now fully operational also for combined transport. Overall, there is a freight transport capacity of 260 train paths per day.
- Rail Passenger Transport: 2 tracks per hour for north-south passenger trains are provided through the base tunnel, with a travel time between Zurich and Lugano of only 2 hours. In Ticino, the S-Bahn Ticino with direct trains between Lugano and Locarno is fully operational and in the Canton of Uri, access to fast trains at Altdorf was improved.

On the **Brenner corridor**, a major milestone was reached towards a timely completion of the Brenner Base Tunnel (BBT) by 2032. In July 2022, drilling has been started on the construction lot “H41 Sillschlucht-Pfons” which is one of the biggest Austrian construction lots of the BBT with the excavation of 22.5 km of main tunnel tubes and additionally 38 cross passages with a total length of about 2.3 km. Also, construction works have been launched for the Southern access route of the Brenner Base Tunnel. Preparatory construction works for the realisation of the construction lot A of the access route Fortezza/Franzensfeste – Ponte Gardena/Waidbruck has been started. The 22.5 km long double track railway line runs mainly in the tunnel. Estimated construction time: 7 years. In the first quarter of 2023, work is expected to start on the new Trento railway bypass, one of the priority lots of the Brenner corridor. By the end of 2023, the elaboration of the

economic feasibility project of the other priority lot, i.e. the Rovereto railway bypass, is also expected.

Also for the **Lyon-Turin railway link**, construction work has continued on the French side in 2022. Drilling operations have started on Thursday 8 December for the tunnel connecting Saint Jean de Maurienne and Saint Julien Montdenis. The 3-kilometre-long tunnel will be added to the 10,5 km already built in April between Saint Martin la Porte and La Praz, less than 15 kilometers from the border with Italy. This new section will be the access point to the border-crossing tunnel that will run from Saint Jean de Maurienne to Bussoleno, crossing the Mont d'Ambin. The tunnel will stretch over 57 km and will offer an alternative route to the Frejus tunnel. Construction of the base tunnel on the Italian side is expected to start in 2023.

6.2.4 Pillar 4: Passenger transport

Mobility hubs for public transport

Throughout 2022, the iMONITRAF! regions were able to take into operation new infrastructures and services to promote public transport – also leading to easier solutions for cross-border travelling and commuting.

An important focus was put on the further development **of intermodal passenger centers** as hubs to support sustainable passenger transport.

- In **Ticino**, the **Interreg project SMISTO** (Sviluppo della mobilità integrata e sostenibile tra Ticino e Lombardia) implemented various measures for the promotion of cross-border transport. A special focus was put on improving mobility hubs and non-discriminatory access to public transport: enlargement of Park+Ride areas, barrier-free access to public transport and equipment with tactile markings, improvement of passenger information, etc..
- The **Autonomous Province of Bolzano** took into operation new “**intermodal passenger centres**” in Brixen/Bressanone and Bruneck/Brunico. The centres are built at the respective train stations allowing efficient intermodal exchange between railway, bus and bike mobility.
- In **Tyrol**, a new “**mobility centre**” was opened in Lienz to improve the accessibility of the region, with a special focus to improve the cycling tourism offer. Specific elements of the mobility centre include the modernization of the train station to improve barrier-free access, more park+ride options for bikes and cars and a new underpass to connect the two city districts.

New ticketing solutions

In Austria and within the Euregio, many attractive **ticketing solutions** have been developed over the last years with the Euregio ticket and the Klima Ticket. In 2022, these solutions were further developed:

- **Tyrol further complemented its offer with a Klima Ticket (climate ticket) for young people** under the age of 26. The annual ticket U26 costs 265 Euros/year and allows free travel in public transport throughout the Land of Tyrol.
- **Trial tickets in Tyrol:** To cushion the overall increase in energy and living costs, Tyrol has also promoted special “trial tickets” for public transport with a 58% reduction for monthly tickets between September and December 2022.

- **Promotion of Klima Ticket:** To incentive the use of public transport also beyond this promotion period, the price of Klima Tickets is also reduced by 10% for the year 2023 and tickets are not adjusted to the general price developments (inflation).
- **Euregio Ticket Students:** In the Euregio, the agreement on the "Euregio Ticket Students" has been extended for further three years. Students under the age of 28 who are enrolled in a university or equivalent educational institution in the Euregio can continue to use public transport in the three Euregio countries of the European Region Tyrol-South Tyrol-Trentino cheaply and comfortably with one ticket.
- **New architecture for an integrated information and ticketing system in South Tyrol:** To further develop an improved information and ticketing solution for the South Tyrolean public transport, the Autonomous Province of Bolzano has finalized the European Project "Bingo" (financed by the European funds for regional development) in 2022 after about six years of implementation. The project has first conceptualised and then implemented a new computer architecture for an information and ticketing system. A special focus was the application of European standards for data exchange, in line with the latest requirements of the European regulation.

Infrastructures for public transport and cycling

To further develop public transport and to improve its quality, several improvements of transport infrastructures and/or services have been agreed upon throughout 2022:

- **Missing link between Brenner railway and Val Pusteria/Pustertal railway:** Thanks to the final approval achieved in 2022, the construction of the infrastructure project of the Val di Riga/Riggertal will officially start in 2023. The project will ease the rail connection between the Brenner railway and the Val Pusteria/Pustertail railway. It will be possible to introduce direct connections between these two corridors, avoiding the transfer in Fortezza/Franzensfeste. Thanks to this intervention, the travel time between Bolzano/Bozen and the Val Pusteria/Pustertail will be reduced. Timetables will be improved and further harmonised.
- **Improvement of cross-border public transport:** The further extension of the cooperation agreement between the Autonomous Province of Bolzano and Tyrol for the cross-border train connection Innsbruck-Fortezza/Franzensfeste-Lienz promotes sustainable mobility in the Euregio. Also, the cross-border bus connection in the Rhaetian triangle will be guaranteed also for 2023.
- **Purchase of eight new trains for regional passenger transport:** The provincial government of Bolzano has decided to purchase eight new trains (11.8 mio. Euro), with more space for passengers and bikes. The "Coradia Stream" low-floor trains are specially designed for regional transport, but can also be used on high-speed lines. The multi-system trains have the current European safety system ETCS and can travel across national borders. Funding is partly provided by the provincial budget and partly with money from the National Recovery Plan (PNRR).

The **Autonomous Provinces of Bolzano and Trento** also put a strong focus on the further development of the **cycling infrastructure** in 2022. The first Provincial cycling plan was approved by the Autonomous Province of Bolzano with a special focus to improve the cycle network in rural areas. New cycle lanes were introduced on the roads crossing the Sella and Gardena passes to increase safety for both cyclists and drivers sharing the road space. The Autonomous Province of Trento has concluded the tender for the cycle path connection between Pergine Valsugana and Trento. In 2023 the lot that connects the city of Trento with the beginning of the Valsugana

area will be made operational. This could have a positive effect on the high pressure of private commuter traffic towards Trento.

Tourism transport

With increasing tourism flows in **South Tyrol**, especially in some of the touristic hot spots, the Autonomous Province of Bolzano has also launched specific measures to better steer traffic flows. For example, for the hot spot **Lago di Braies/Pragser Wildsee**, the Autonomous Province of Bolzano and the municipality of Braies/Prags have implemented a pilot project with a reservation system for visitors arriving by car and a targeted offer of sustainable means of public transport. To optimize sustainable mobility planning in the **Dolomites**, the local governments of South Tyrol and the neighboring Provinces of Trento and Belluno have signed a memorandum of understanding with the Italian Ministries of Transport, Innovation and digital transformation. The aim is to create a “Dolomites Low Emission Zone” around the Mountain Passes of the Dolomites by implementing a strategy of sustainable mobility, i.e. to reduce and steer traffic flows by innovative means of digitalisation.

Special attention is already given to the preparation of the **2026 Olympic Winter Games**. The **Autonomous Province of Trento** is working on a sustainable mobility project called “Bus Rapid Transit” which shall improve public transport along the Fiemme and Fassa valleys. The project consists in the creation of a local public transport management system that guarantees a reduction in travel times and greater competitiveness of public transport compared to private mobility. Infrastructural interventions are also planned for the construction of lanes dedicated to public transport.

Transition towards alternative fuels

In the **Autonomous Province of Bolzano**, the subsidy system for the purchase of electric cars and charging systems was continued in 2022. The public charging network for electric mobility has been completed by the installation of the last fast chargers. The network includes now 33 hyper chargers which are installed along the main roads in the different districts of the Province. Also, three new hydrogen buses for urban public transport services in Bolzano were purchased. The fuel cell buses are 100% emission-free and the used hydrogen is “green”.

In **Tyrol**, a **decarbonisation strategy for public transport** (bus services only) was developed by the public transport provider VVT and agreed by the regional government in September 2022. The strategy has the major objective to decarbonise all bus services up to 2035.

Also, in the **Autonomous Province of Trento**, the **electrification of local railway lines** has a high priority. The electrification project of the Valsugana railway line obtained a favourable opinion in the environmental impact assessment procedure and the development of the executive design is expected in 2023.

6.2.5 Pillar 5: Innovative approaches

The Autonomous Province of Bolzano has commissioned a feasibility study for a digital reservation system for HGVs on the Brenner motorway A22. The results concerning the technical and legal feasibility are currently being shared with the institutional partners along the Brenner corridor. The study has also been deposited at the Italian Ministry of transport where it is being examined for a possible implementation.

Making better use of available digital solutions is also the objective of the new **Platform for integrated mobility monitoring** along the Brenner axis which has been implemented by the **Autonomous Province of Trento** (implemented in the frame of the project MERIDIAN). The system will enable to make a real time prevision of current traffic situations and by means of DSS technologies (decision-support-systems) it will help to manage the critical issues in the network. The objective is to build a full database available for the stakeholders involved in the road infrastructure management, supporting C-ITS (Cooperative Intelligent Transport Systems) services. At the same time the aim is to obtain an origin-destination matrix constantly updated, in order to know the influence of extra-urban traffic on the Brenner axis for the creation of an integrated mobility model. Regarding freight transport the system should provide constant and upgraded information on alternative routes to the Brenner motorway taken by truck drivers to avoid tolls and should provide to road managers useful elements to develop mobility policies that can discourage the inadequate use of the local network, which locally causes a significant increase in atmospheric pollution.



7 Outlook 2023 and beyond

iMONITRAF! has become the central platform for technical knowledge and political exchange on transalpine transport. Therefore the participating regions already agreed to continue the cooperation in the period 2023 to 2025. With the policy pathway, the target indicator system and the ongoing political discussions on crucial modal shift and decarbonization strategies, many starting points for further activities are already defined and the political discussions during the roundtable in Innsbruck in December 2022 highlighted the increased need for further cooperation. Both along the iMONITRAF! corridors and between them, the cooperation in the network supports the coordination of policy measures and the exchange of experiences.

For the next phase, the network will focus on the topics that are reflected in the iMONITRAF! Resolution 2020, the new policy pathway and set of target indicators:

- **Monitoring system:** the approach of the monitoring system will be further strengthened through the implementation and interpretation of the target indicators. The monitoring indicators will be further developed for easier communication, to support the fact-based approach of iMONITRAF!.
- **Policy measures for modal shift:** With respect to accelerate modal shift, iMONITRAF! will follow-up on all activities to improve the HGV pricing systems on the Alpine corridors. Also, the network agreed to further investigate the potential of additional steering and reservation instruments to improve capacity use of the Alpine corridors (road and rail). This will require a closer look at the role and potential of digital technologies.
- **Decarbonisation:** To support the top-runner approach, iMONITRAF! will further investigate joint solutions to support the use of alternative technologies for heavy-duty vehicles and to develop the Alps into a model region for decarbonised road-freight transport.
- **Knowledge hub and sparring partner:** In the new period, iMONITRAF! will further develop its role as knowledge hub and sparring partner for other networks and institutions, especially it will ensure that the position of the most affected Alpine transport regions is considered in discussion at inter-regional, national, macroregional and European level. Networking efforts will play a crucial role in the new period to foster an ambitious framework for modal shift and decarbonisation of the transport fleet.

For 2023, the following specific windows-of-opportunity are already identified and iMONITRAF! has launched first activities to use them as effectively as possible:

- **Networking at European level:** A joint political statement for networking on the TEN-T regulation is already prepared and will be shared with relevant decision makers. Equally, a position paper on the Combined Transport Directive is launched and iMONITRAF! is in touch with relevant network partners to identify windows-of-opportunity for networking. Other interesting dossiers that will be picked up at European level are the Directive on Weights and Dimension and the Energy Taxation Directive.
- **Follow-up of Simplon Alliance:** Specific activities to implement the measures of the Simplon Action Plan are not yet identified. But iMONITRAF! has already signalled its interest to support the implementation of the Action Plan, especially with respect to the capacity management measures and the role of the regions for decarbonising road freight transport.
- **Synergies with EUSALP:** Mobility is one focus topic of the Swiss EUSALP Presidency 2023. In autumn, a Mobility Event is planned in Ticino and iMONITRAF! will offer its support and knowhow in shaping this event and in contributing to its success.

- **Capacity management:** iMONITRAF! will work on a synthesis study to bring together state-of-the-art knowhow on mechanisms for integrated capacity management and reservation system. The South Tyrolean study on a slot management system will play a crucial role in this synthesis and will be compared to other options.
- **The regional role in accelerating the decarbonisation of road freight transport:** As one focus topic, iMONITRAF! will also launch an exchange on the role of the Alpine regions in supporting the transition to clean vehicles. Which measures and incentives can be implemented at regional level to accelerate the uptake of alternative technologies and which aspects require a stronger coordination?

