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Iceland: Selected Issues

INTERNATIONAL MONETARY FUND

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ICELAND

SELECTED ISSUES

June 2022

This Selected Issues paper on Iceland was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed on June 3, 2022.

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June 3, 2022

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FIGURE

HOUSING MARKET RISKS AND HOUSING AFFORDABILITY[1]

House prices in Iceland have increased markedly since the onset of the COVID-pandemic, with signs that the valuations have exceeded macro fundamentals and long-term trends. Overvaluation has important implications for macroeconomic and financial stability, and housing affordability. House price cycles seem to be closely linked with the business cycle, indicating an amplification risk in the event of price correction. Thus, well calibrated and coordinated policies are crucial to navigate the house price cycle, minimize adverse feedbacks, and reduce affordability risk.

A. Surging House Prices

1. House prices have increased markedly since the onset of COVID-pandemic. Housing demand has increased strongly due to rapid shifts in fundamentals, including historically low interest rates, higher income, and looser credit standards. With work from home becoming a necessity and a common practice, demand has also shifted due to households' changing needs. These factors interacting with constrained supply, in part due to stalling economic activity and supply chain disruptions, have led to severe mismatches between supply and demand. During the period from end-2019 through April 2022, real house prices (adjusted by the CPI) for the whole country increased by 20 percent.[2]

2. Various metrics indicate growing imbalances. Compared with standard metrics commonly used in the literature, such as income, wage, and rent price, the real house prices indicate a strong tendency of deviating from fundamentals. The ratios of house prices to income and to building costs have exceeded their pre-GFC levels. These ratios have also grown faster than in peer countries and compared to the average growth in OECD countries.

3. The growing divergence of house prices from trend is driving the overall financial cycle. Compared to other key measures of the financial cycle, such as credit and funding cycle, the housing cycle shows a stronger tendency of deviation from its long-term trend. For instance, using a standard filtering method (HP), the real house prices were 16 percent higher than their long-term trend in January 2022. Measured by a standard credit-to-GDP gap, the credit cycle has been closing recently, led mainly by increasing household debt and lower GDP especially in 2020. After several years of negative gap, the funding cycle has also converged to zero, reflecting growth in the banking system's unstable funding (CBI, 2021).

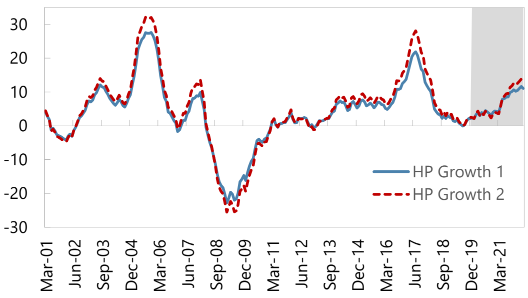
[1] Prepared by Mahir Binici and Nujin Suphaphiphat.

[2] The appreciation is 22 percent when house prices are deflated by the CPI measure that excludes house prices.

Figure 1. Iceland: The Growth of Housing Prices

House price growth has picked up during the pandemic…

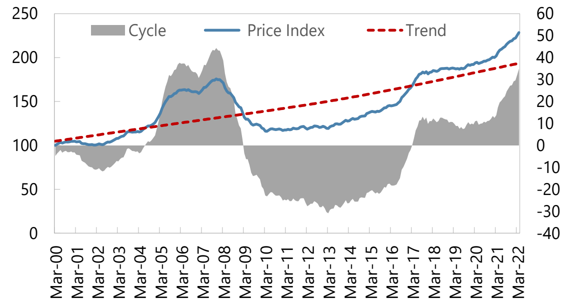
Real House Price Growth
(Percent, yoy)



Sources: CBI and IMF staff calculations.
Note: HP Growth 1 and 2 indicate house price growth deflated by the CPI including and excluding house prices in their construction.

…opening a gap relative to house price trend….

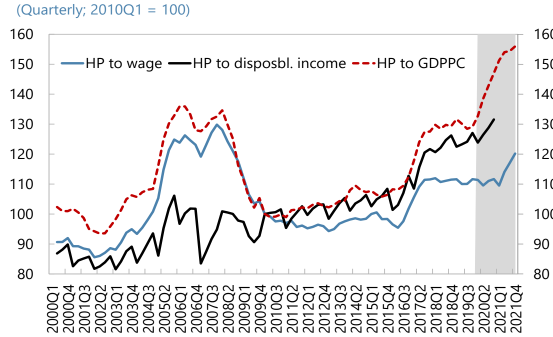
Real House Price Index
(March 2000=100)



Sources: CBI and IMF Staff Calculations.
Note: Hodrick-Prescott (HP) filter is used to construct trend.

House prices relative to income have reached historical highs…

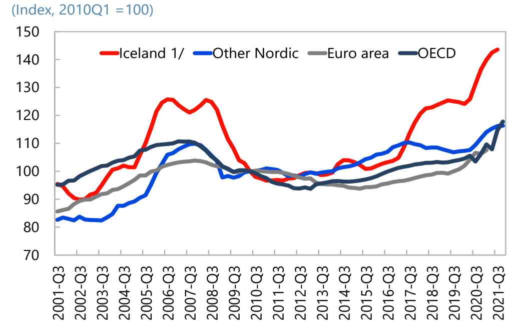
House Prices to Different Measures of Income
(Quarterly; 2010Q1 = 100)



Sources: IMF RES; Statistics Iceland; IMF staff calculations.

…even compared to other advanced economies.

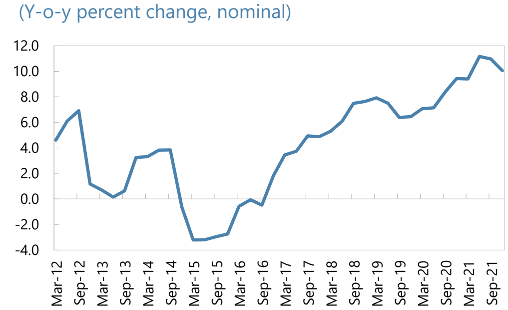
House Price to Income Ratio in Iceland and Peer Countries
(Index, 2010Q1 =100)



1/ Four-quarter moving average of housing prices relative to GDP per capita.
Sources: OECD, Global Property Guide and IMF staff calculations.

B. Rising Systemic Risks

Iceland: Household Credit Growth
(Y-o-y percent change, nominal)



Sources: CBI and IMF staff calculations.

4. **Overvalued house prices combined with a higher household debt burden could increase systemic risks**. By end-2021 household credit growth reached 10 percent, raising household debt to 84 percent of GDP. The combination of high house prices and household indebtedness may trigger a negative spiral between the financial system and the economy in the event of a house price correction. The spiral might be amplified further by the systemic risk arising from the structure of mortgages in Iceland. The large share

of indexed and variable rate loans would imply that a persistently high rate of inflation would result in greater household indebtedness, impairing borrowers' debt service capacity.[3,4]

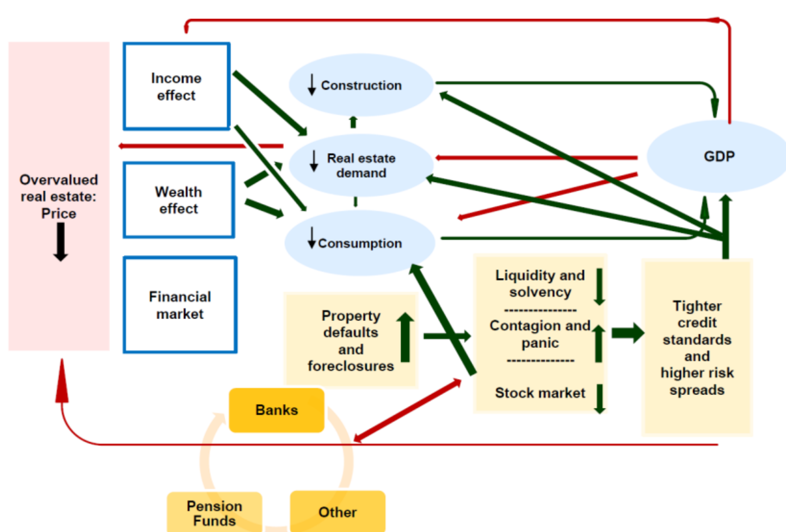
5. The house price cycle is closely associated with the business cycle. Iceland's data suggest that there is a close correlation between the house price cycle, private consumption, and residential investment. Thus, house price variation, through income, wealth, and financial market effects, could amplify feedback loops, and endanger macroeconomic and financial stability. When associated with increasing household debt, an overvaluation cycle followed by falling house prices could affect significantly economic activity, as the adverse impact on the financial system might be more pronounced, amplified further by the interconnectedness of the pension funds with the financial system in Iceland and their systemic importance. For instance, increasing default rates on household debt to the pension funds would weaken pension funds' balance sheets, resulting in lower future benefits, which in turn reduces borrowers' debt service capacity, as well as consumption and other spending.[5]

Iceland: Correlation of House Price and Economic Activity Cycles

	[1]	[2]	[3]	[4]
[1] GDP	1			
[2] Private Consumptions	0.76	1		
[3] Investment	0.69	0.89	1	
[4] House Price	0.61	0.87	0.88	1.00

Source: IMF staff calculations.
Note: Table displays the correlation matrix for the cyclical components of respective variables over 2000Q1-2021Q3. Hodrick-Prescott (HP) filter is used to construct a trend, accordingly the cycle is the difference between observed data and its trend.

Figure 2. Iceland: Financial Accelerator in a Housing Crisis



Source: Modified from Duca et al. (2021).

[3] Unlike in the United States and other advanced economies, a 30-year fixed-rate mortgage loan is not offered by the financial system in Iceland. The closest product called a 'fixed-rate, non-indexed' mortgage is in principle an adjustable-rate mortgage loans (ARM) with a fixed interest rate for up to 5 years.

[4] For indexed loans, the effect of inflation on indebtedness depends also on the underlying measures of indexation.

[5] Pension funds and other financial institutions that engage in lending to the households are subject to the same borrower based MPMs. Data suggest that the pension funds, on average, lend at lower LTV ratios than the banks.

C. Informing Housing Market Policies

6. Staff's quantitative analysis examines the interplay between house prices and related factors. The following baseline vector auto regression (VAR) model is used to formally assess the linkage between macro fundamentals, policies, and house prices:

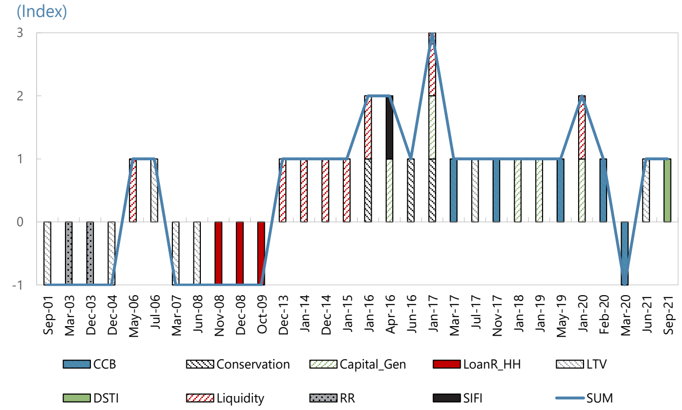
$$A_0 Y_t = a + A(L) Y_{t-1} + \varepsilon_t$$

The vector Y includes (in this order) private consumption, residential investment, CPI, the real house price, monetary policy rate, an index of macroprudential measures (MPM, Box 1), and the real effective exchange rate. The identification of the VAR is achieved by assuming that the A_0 matrix has a Choleski structure.[6] The model is estimated with seasonally adjusted (whenever appropriate) quarterly data for the 1995Q3–2021Q3 sample period. The VAR model is specified in log-level, except for the policy rate and the MPM index (both in level). An optimal lag of order of 2 is chosen based on the common information criterion. To present results from the VAR model, we utilize impulse-response functions (IRF) to describe the evolution of a model's variables in reaction to a shock in house prices, monetary policy or macroprudential measures. We present results for one standard deviation shock using orthogonalized IRFs.

Box 1. The Index of Macroprudential Measures

Macro prudential measures were used sporadically before the GFC and more frequently in recent years. Based on IMF's cross-country database, which is available through 2021, several MPMs have been actively used in Iceland. At the height of COVID pandemic, among other measures, the CBI eased capital requirements by lowering the countercyclical capital buffer (CCyB) from two percent to zero to ease use of credit institutions' capital, if needed, and to facilitate lending to households and businesses. With increasing household debt and house price pressures, in June 2021, the CBI tightened the macroprudential measures first by lowering the loan-to-value ratio (LTV) for consumer mortgages from 85 percent to 80 percent (keeping it at 90 percent for first-time buyers). In September 2021 (effective December 2021), the CBI also introduced a debt-service-to-income (DSTI) limit of 35 percent (40 percent for first-time buyers). In addition, in view of the build-up of cyclical systemic risk, the CBI raised the CCyB back to two percent (effective September 2022).

Iceland: Macroprudential Measures
(Index)



Sources: Alam et al. (2019) and IMF staff calculations.

The index of macroprudential measures uses a database constructed and updated by Alam et al. (2019). A specific MPM takes the value of +1 if a given measure was tightened and -1 if it was eased in a given quarter, leaving zero elsewhere. The aggregate macroprudential index sums up all different dummies for the various macroprudential tools. This means that, if multiple actions in the same direction are taken within a given quarter, the variable could take on the values

[6] The same approach is taken by Calza, Monacelli, and Stracca (2013), and similarly closed specifications accounting for the house price macro-relationship have been used by Iacoviello (2005), Goodhart and Hoffman (2008), among others.

Box 1. The Index of Macroprudential Measures (concluded)

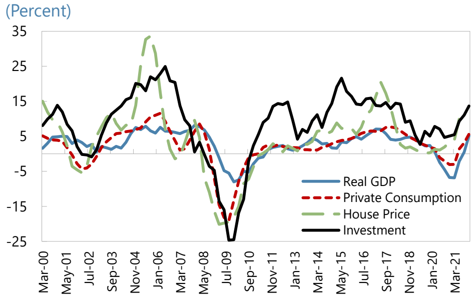
of +2 or -2, or +3 and -3. It also means that a tightening action and a loosening action taken within the same year could cancel each other out.

Our VAR analysis uses two measures of an aggregate MPM index to assess the impact of MPM tightening on house prices. One of them uses the sum of all measures, and one uses only borrower-based LTV and DSTI measures.

7. As shown below, the cyclical components of the house prices and real economic activity suggest a strong and positive association. The IRFs from the VAR model also show that a shock to the house prices has a meaningful impact especially on private consumption, and to a lesser extent on the residential investment.

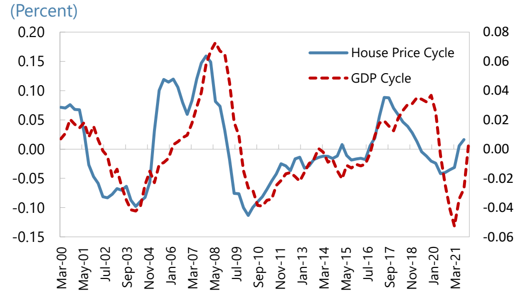
Figure 3. Iceland: House Price Cycle and Real Economic Activity

Output and House Price Growth
(Percent)



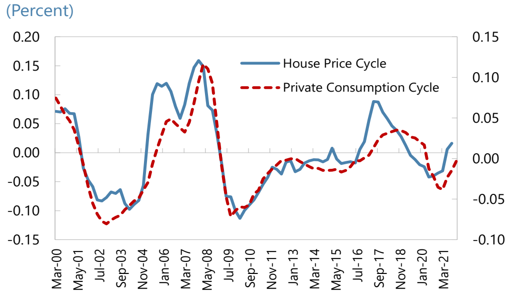
Sources: CBI, Statistics Iceland and IMF staff calculations.

Real GDP and House Price Cycle
(Percent)



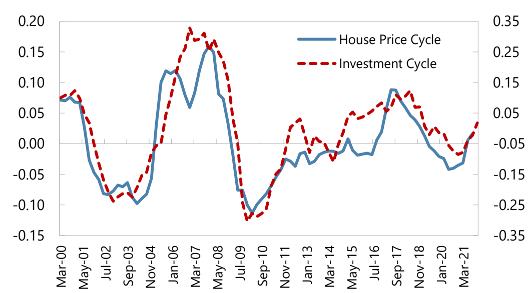
Sources: CBI, Statistics Iceland and IMF staff calculations.

Private Cons. and House Price Cycle
(Percent)



Sources: CBI, Statistics Iceland and IMF staff calculations.

Investment and House Price Cycle
(Percent)

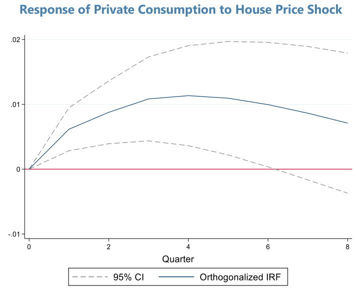


Sources: CBI, Statistics Iceland and IMF staff calculations.

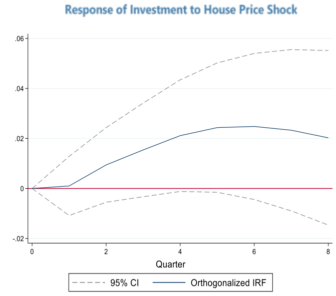
Note: Hodrick-Prescott (HP) filter is used to construct a trend, accordingly the cycle is the difference between observed data and its trend.

Figure 4. Iceland: Impulse and Response Functions for a House Price Shock

Response of Private Consumption to House Price Shock



Response of Investment to House Price Shock

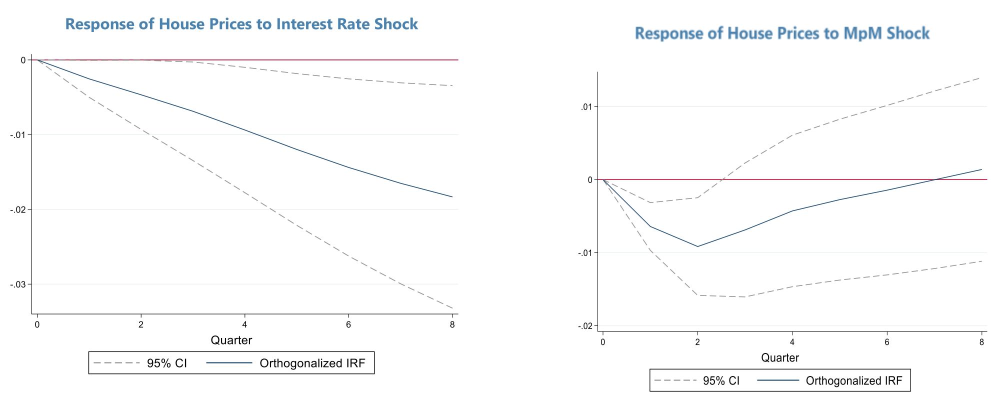


Source: IMF staff Source: calculations.

8. Monetary policy seems to play a significant and long-lasting role in addressing house price pressures. The IRFs suggest that a positive monetary policy shock, meaning one standard deviation increase in the key policy rate, leads to a significant decline in house prices, especially after the first few quarters. The result suggests that housing prices are a channel for transmission of monetary policy to economic activity. The VAR result is similar to the one in Calza et al. (2013) who find a significant effect of monetary policy on housing markets, especially in countries where the underlying mortgage market is more developed, and mortgages are mostly of the variable rate type. The structure of the mortgage market in Iceland is supportive of this finding.[7]

9. Borrower-based measures seem to dampen house prices, but the effect is transitory. We present IRFs using the sub-index of borrower-based measures only, which suggests that a tightening—e.g., a lower LTV ratio and/or a lower DSTI ratio—also dampens house prices significantly for a few quarters. The impact of an aggregate MPM tightening, using an overall index including all measures, is however more limited than the impact of monetary policy tightening. The aggregate index includes a broad range of measures such as capital adequacy or liquidity requirements that are aimed at improving banking system resilience rather than mitigating the house price cycle. The results on the impact of borrower-based measures are in line with cross evidence presented in Cerutti et al. (2017) who show that these policies are used frequently in advanced countries with some impact on growth in house prices, but with a weaker association with credit growth in more developed and more financially open economies. Others, for instance, He et al. (2016), find similar results, but they also attest that DSTI or LTI caps can be especially effective as automatic stabilizers, as they become more binding when house prices grow faster than disposable income, thus limiting the procyclical feedback between credit and house prices.

Figure 5. Iceland: Response to House Prices to Monetary Policy and MPM Shock



7 Among others, Nocera and Roma (2017) find a strong contribution of monetary shocks to real house price growth for the euro area countries, while Dias and Duarte (2019) find similar results for the US.

D. Containing Housing Market Risks

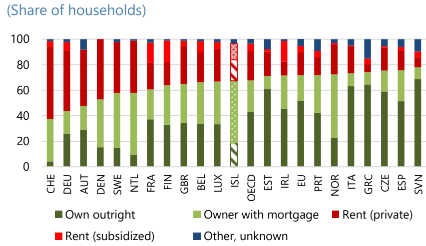
10. The ongoing monetary policy tightening cycle should help address Iceland's house price pressures. The tightening cycle in monetary policy would steer inflation expectations toward the target, thus dampen the vicious feedback loop between house prices and inflation.

11. Further macroprudential tightening through binding and effective borrower-based measures could help contain systemic risks and create further buffers in the financial sector. Recalibrating the existing DSTI regulation by requiring lenders to apply a premium over the contractual rate in the analysis of borrowers' debt-service capacity would mitigate household leverage and default risks. Introducing a debt-to-income cap could further complement LTV and DSTI caps in addressing systemic risk. While DSTI limits seem to be more commonly used than DTI ratios[8], the efficacy of DSTI caps—calculated at origination—depends on the loan maturity and the interest rates at origination and can be hindered when mortgage loans are based on variable (or indexed) rates. Therefore, a DTI cap could be more constraining as it limits a borrower's aggregate debt level at the time of loan origination. Further consideration could also be given to the risk profile of mortgage loans in calculating the risk-weighted assets and standard capital adequacy, which would improve banking system resilience, especially in the presence of a growing systemic risk. Thus, a tighter macroprudential stance through recalibration of the existing measures, introducing a DTI and additional consideration of capital adequacy could help create more buffers for the financial system. This would also make the financial system more resilient and limit the buildup of vulnerabilities. MPM tightening should also be informed by a well-designed stress-testing exercise that investigates the effect of various asset price and business cycle scenarios on the resilience of the banking system.

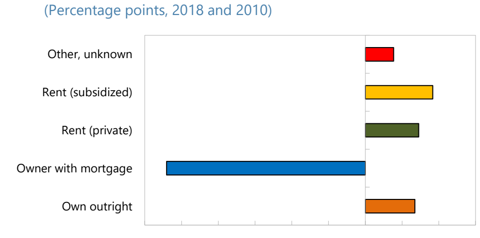
E. Addressing Housing Affordability

12. A surge in house prices could aggravate already low housing affordability. Iceland traditionally has a high home ownership rate compared to other Nordic countries, although the share of renters increased over time, partly due to growing immigration. Almost 30 percent of families are renters in 2019—about 6 percentage points more than in 2010. A surge in housing price, often accompanied by an increase in rental prices, could contribute to lower housing affordability to renters and aspiring homeowners.

Iceland: Tenure Types, 2019 or Latest Year Available
(Share of households)



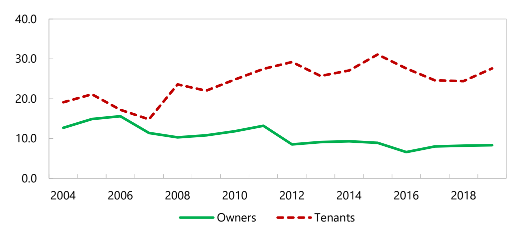
Iceland: Change in the Share of Renters
(Percentage points, 2018 and 2010)



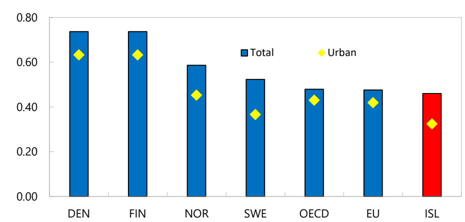
[8] Based on the European Systemic Risk Board (ESRB)'s database (the overview of national macroprudential measures).

13. Various indicators point to relatively low housing affordability in Iceland, particularly for renters and low-income households. Housing cost (mortgage and rent) accounts for almost 30 percent of total disposable income in Iceland. The burden is the highest for the bottom-quintile households who spend 35 percent of total disposable income on housing. In addition, the housing cost overburden rate—with over 16 percent of the population spending more than 40 percent of disposable income on housing cost—is one of the highest among the OECD countries.[9] Housing affordability pressures are higher for renters than for homeowners, as the housing cost overburden rate for renters is more than double that of owners. This is partly because the majority of renters are at the lower-income quintile. In 2018, almost half of the bottom income households rented, compared to only 6 ½ percent of the top-quintile households. The affordability pressure is prevalent among renters at both subsidized and private rates, although the rate of overburden is slightly lower for the former. The rate of housing cost overburden for homeowners was low in 2012–18, partly due to a low interest rate environment. In term of quality of housing, survey results show that only 46 percent of respondents report satisfaction with affordable quality housing, while the overcrowding rate, although relatively small, has increased over time.

Iceland: House Cost Overburden Rate by Tenure Status
(2004-19)

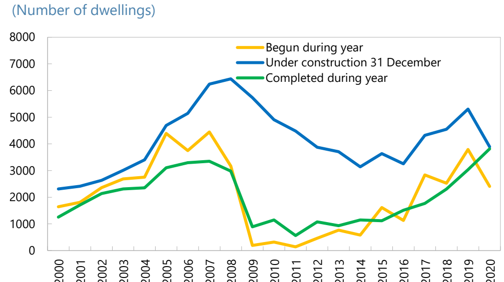


Iceland: Share of People Reporting Satisfaction with the Availability of Quality Affordable Housing

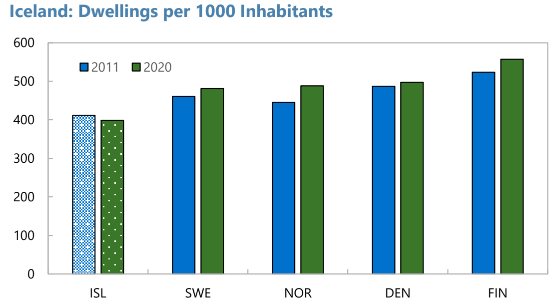


14. The housing stock, although increasing in recent years, has not kept up with demand, contributing to relatively low housing affordability. The number of new residential buildings declined sharply after the GFC, resulting in a sharp rise in housing prices and, subsequently, rents. In 2020, completed residential buildings surpassed the pre-GFC peak, but the COVID-19 pandemic significantly slowed new constructions. Although the housing stock has grown, the housing output per 1000 inhabitants declined in 2011–20.

Iceland: Residential Buildings 2000-20
(Number of dwellings)



Iceland: Dwellings per 1000 Inhabitants



[9] Based on the 2018 data. The latest figure from Statistics Iceland suggested that a housing overburden rate has improved in 2021.

15. The tourism recovery—albeit gradual—could exacerbate the availability of existing rental homes and may put an upward pressure on future rental prices. The pre-pandemic surge in tourists put pressure on the long-term rental market, as owners converted their existing apartments into short-term rentals, including Airbnb, due to a gap between the availability of long and short-term rental housing. A study (Mermet, 2019) shows that Airbnb-type supply rose more than six-fold during 2013–18, accounting for 5 percent of the housing stock. During the pandemic, the availability of long-term rental housing rose due to the collapse in the tourism sector, moderating the increase in rental prices. Nonetheless, the recovery in the tourism sector after the pandemic could again put a strain on the long-term rental market.

F. Designing Effective Policies to Tackle Housing Affordability

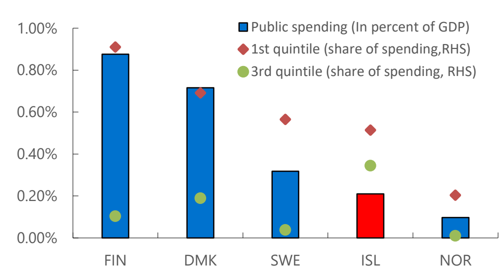
16. Measures to address housing affordability need to be designed carefully to ensure their effectiveness. Empirical evidence showed that measures aiming at supporting homeowners, such as mortgage interest deduction and subsidies for the first-time home buyers, are often poorly targeted, resulting in higher housing prices and lowering affordability (OECD, 2020). Many demand-side policies focusing on promoting rental affordability, including housing allowance and subsidy—even when targeted—can lead to offsetting price increases for the targeted group if supply is inelastic. Supply-side policies also generate some tradeoffs. For example, while tax on vacancy can increase supply of rental dwellings without raising prices, it requires a comprehensive database of the stock of housing vacancy. To this end, the proposed measure to obligate landlords to register leases in a public database is a step in the right direction. Limits on short-term rental services which aim at promoting long-term rent have been found to benefit middle to high income household. Social housing can be an effective tool for affordability when supply is inelastic to price. However, excessive provisions can crowd out private rental market and suppress its development. While other supply-side policies such as expanding public infrastructure and easing of dministrative procedures for construction can increase supply of housing, it is costly and takes time to implement.

17. In the medium term, focusing on structural measures that reduce construction costs and increase supply by eliminating red-tape and reducing the period for obtaining building permits is likely to have the highest pay-off. The OECD has reviewed several regulatory frameworks related to the construction sector and provided key recommendations in order to boost productivity in the sector and help address rising housing cost. The measures include simplifying and clarifying planning regulations, reducing administrative burdens and the lengthy process of obtaining building permits, and introducing one-stop shop for permits and inspections.

18. Support measures will remain necessary to ease affordability in the short term.

- **More targeted housing assistance:** There is room to increase the efficiency of public spending on housing allowances by making it more targeted. Compared to other Nordic countries, public spending on housing allowances in Iceland is still relatively low at 0.2 percent of GDP, which could partly reflect a

Iceland: Public Spending on Housing Allowances



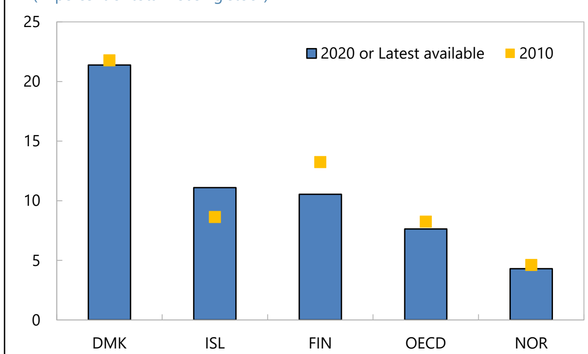
Source: OECD

strong homeownership rate in the country. More than 20 percent of the allowances support households in the 3rd quintile, suggesting there is room to make the allowance more targeted toward low-income households.

- **Gradually phasing out incentives favoring homeownership:** Support to households for homeownership, particularly mortgage interest deduction, tends to be non-targeted and regressive, benefiting mainly high-income households with better access to mortgages (Fatica 2015; Elfayoumi, 2021; OECD, 2020). Other tax incentives for homeowners produce similar effects, including exemptions from capital gains, tax-exempt imputed rents, and special depreciation allowances for new rental housing construction. It is important that measures aimed at facilitating household and corporate financing target construction of new homes to avoid fueling demand pressures against a very limited housing stock, thus pushing prices up and worsening affordability.

- **Social housing:** The social housing stock in Iceland appears to be moderate, accounting for 11 percent of the total housing stock.[10] It is a useful tool to address housing shortages where housing supply is inelastic to house prices (OECD, 2020). However, social housing can be costly and less flexible than housing allowances. On the demand side, eligibility criteria for access to social housing should be transparent, targeted, and reviewed periodically. It should also facilitate labor mobility across cities and regions, for instance, by allowing eligibility for social housing to be portable (OECD, 2021).

Iceland: Social Rental Dwellings
(In percent of total housing stock)



Sources: OECD

[10] Subsidized rental sector consists mainly of properties owned by the municipalities, voluntary organizations such as the Icelandic Disability Alliance or various associations for elderly people as well as students housing (Sveinsson, 2020).

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ON THE ROAD TO CARBON NEUTRALITY, FISHING FOR ENERGY EXCHANGE AND CARBON ABSORPTION[1]

Meeting Iceland's ambitious climate goals will be challenging in a growing economy and would require continuous determination and effort to advance the pace of technological development. Iceland has the lowest emissions in energy generation in the OECD, but lags in other areas, making emission reduction commitments crucial. The focus should be on reducing emissions under Iceland's direct regulation without losing sight of emissions covered under the European ETS. Energy exchange in road transport and fishing could play a crucial role in meeting Iceland's commitment. This will require uniform carbon pricing policies, a favorable evolution of global technological development, and large redirection or expansion of renewable energy production. The latter involves environmental concerns. Fiscal incentives to meet climate goals need to be revenue neutral and factor other fiscal objectives. Options for carbon sequestration are promising, but not economically viable in the short run. Research and development in this area needs to be continuously supported.

A. Starting from Behind with Clean Fuel

1. **Iceland has the lowest emissions in energy generation in the OECD, but does not fare well in other areas, making reduction commitments crucial.** Iceland is in the top quartile of greenhouse gas emissions per person and unit of economic activity in the OECD, but there are significant differences between energy generation and other sectors. Iceland has the lowest emissions in energy generation among OECD economies, whether measured on per capita or GDP basis. Most of the country's electricity is generated from renewable sources, especially hydroelectric power, and most of its heating needs are covered by geothermal energy. However, Iceland's industrial sector emissions are the highest compared to other OECD countries. This reflects mainly the operation of aluminum smelters located in Iceland partly to reduce their carbon footprint by using clean energy. Transport by air, land, and sea (including the fishing fleet) also generates significant emissions. Land use emissions are also high per capita and relative to GDP but are subject to significant uncertainty and may be measured more strictly in Iceland than elsewhere.

Iceland: Percent Rank in Historical Greenhouse Gas Emissions, 2019 [1/]

	Per Capita	Per GDP
Total without Land Use	83.8	74.1
Total with Land Use	100	100
Energy	35.4	9.6
Energy Industries	0.0	0.0
Manufacturing and Construction	0.0	0.0
Transport	83.8	67.7
Residential	80.6	64.5
Other energy	8.0	8.0
Fugitive	87.0	83.8
Industrial	100.0	100.0
Agriculture	83.8	74.1
Waste	93.5	83.8
Land use	100.0	100.0

Source: OECD

[1/] A higher number implies higher emissions. The percentile indicates the rank from 0 to 100 in which Iceland stands relative to the 38 countries in the OECD with available data. For example, 100 means the country would be the one with the highest emissions of the 38 countries.

[1] Prepared by Jorge Iván Canales Kriljenko.

B. Advancing on Separate Tracks: Emissions Under and Outside the European ETS

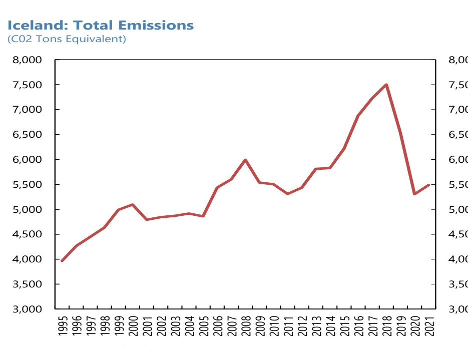
2. **About half of Iceland's emissions are regulated by the European Trading System.** The four largest generators of greenhouse gas emissions are (1) the aluminum smelters accounting for about a fifth of the emissions in 2018; (2) international aviation related to the tourism industry accounting for another fifth; (3) road transport accounting for about 15 percent of emissions; (4) fishing accounting for about 10 percent of emissions, (5) ferroalloys production, accounting for about 7 percent of emissions, and (6) international navigation accounting for about 4 percent. Of these, the European Emissions Trading System (EU ETS) regulates the emissions of the aluminum industry, international aviation, and ferroalloys production. Together these areas account for about half of the greenhouse gas emissions of Iceland.

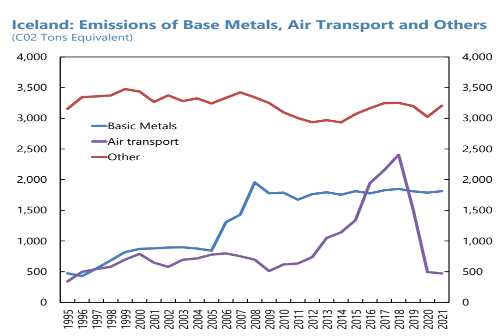
Iceland: Emissions by Subsectors

	1990	2018	Percent Increase	Share 2018	Cumulative
Aluminium Production	634	1,390	119.3	21.7	21.7
International aviation	221	1,304	490.0	20.4	42.1
Road Transport	520	969	86.6	15.1	57.2
Fishing	738	546	-26.0	8.5	65.7
Ferroalloys Production	210	455	116.5	7.1	72.8
International navigation	20	244	1120.0	3.8	76.6
Managed waste disposal sites	19	190	903.9	3.0	79.6
Other emission from Energy Production	61	156	155.0	2.4	82.0
Enteric Fermentation - Sheep	182	144	-20.9	2.2	84.3
Enteric Fermentation - Cattle	109	124	12.9	1.9	86.2
Other manufacturing industries and Construction	162	102	-36.8	1.6	87.8
Transport refrigeration	0	82	…	1.3	89.1
Cultivation of Organic Soils (histosols)	81	81	0.2	1.3	90.4
Inorganic Fertilizers	58	55	-5.9	0.9	91.2
Water Treatment and Discharge	50	45	-9.3	0.7	91.9
Water - borne Navigation	60	43	-27.6	0.7	92.6
Other	848	474	-44.1	7.4	100.0
Total	3,974	6,405	61.2		

Source: Icelandic authorities and IMF staff estimates.

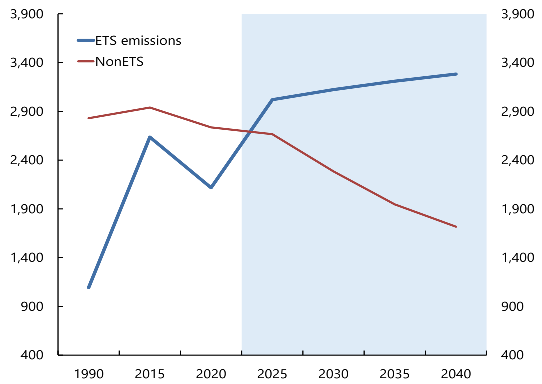
3. **Between 1995 and 2019, emissions generated in Iceland almost doubled.** The expansion was mainly in sectors covered under the EU ETS. It was mainly a result of the large capacity expansion in the aluminum sector during 2005–08, and later of the takeoff of international aviation due to the tourism boom that started in 2012. The collapse in tourism during the pandemic resulted in a large reduction in emissions from international aviation, but those emissions are expected to pick up as the sector recovers.





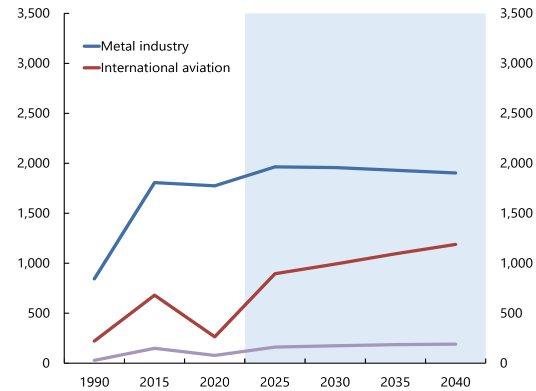
4. In the next few years, emission reductions are projected to be in areas not covered under the ETS. The latest projections of greenhouse gas emissions in Iceland envisages that emissions covered under the ETS will continue to increase through 2040, while other emissions will decline (Government of Iceland, 2022). The authorities envisage that emissions of the metal industry (aluminum smelters and ferroalloy production) and international navigation will increase very gradually, and those of international aviation will recover by 2025 from their low 2020 levels and will continue rising at a slower pace.

Iceland: Emissions Official Forecasts
(C02 Tons Equivalent)



Source: The Environment Agency of Iceland

Iceland: Selected ETS Emissions Official Forecasts
(C02 Tons Equivalent)



Source: The Environment Agency of Iceland

5. While the EU ETS creates incentives for the reduction of emissions at the European level, the incentives for individual countries with renewable energy resources are unclear. For instance, although at the European level it is important to reduce emissions from aluminum production, that reduction in emissions could be achieved by setting smelters close to renewable electricity sources, such as Iceland. The same applies for other energy-intensive industries such as ferroalloys. Although this would achieve reductions in European levels of emissions from those industries, emissions generated in Iceland would tend to increase. Tradeoffs among policy objectives could build up. Greater industrial production with clean energy could increase employment, exports, and the general well-being of the population, while at the same time contribute to climate goals at the European level. The aluminum industry produces a crucial input in the production of low emission vehicles using renewable power instead of coal as other global large-scale aluminum producers. The large expansion of aluminum and ferroalloy production in Iceland contributed to the economic recovery and welfare improvement following the global financial crisis. Aluminum smelters have also been a strategic and reliable long-term user of electricity in Iceland, which helped pay for the cost of capital invested in hydroelectric infrastructure. However, the expansion of such activities increases emission generation in Iceland and exposes the Icelandic population to greenhouse gases. The environmental and, in principle, health costs of such activities need to be factored in in considering industrial policy decisions for expanding activities whose emissions are covered under the ETS. The official emission forecasts do not currently envisage a large-scale expansion of existing or future ETS activity.

C. Doing Iceland's Share: Ambitious Goals and Comprehensive Plans

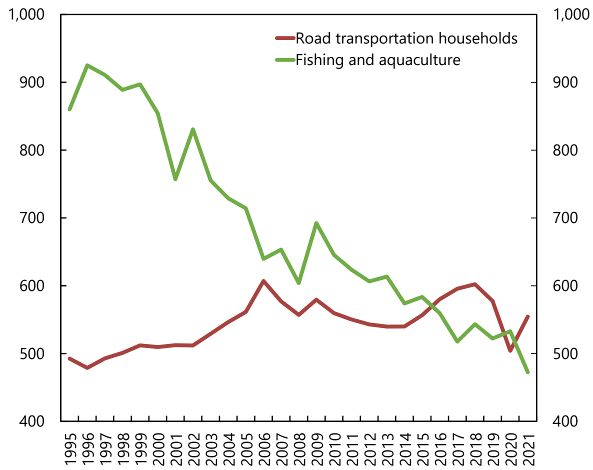
6. The authorities' goals for reducing the domestic carbon footprint are ambitious. Among areas outside the ETS, Iceland has committed to reach carbon neutrality (net zero emissions) no later than 2040 and to eliminate its use of fossil fuels by 2050 (Government of Iceland, 2021c). In the context of the Paris Agreement, jointly with the EU and Norway, Iceland committed to achieve a 40 percent reduction of total emissions, without land use, between 1990 and 2030. Iceland's contribution to the joint commitment was to reduce emissions by 29 percent from their 2005 level. More recently, the group has raised its commitment to reduce emissions by 55 percent from their 1990 levels, but Iceland's contribution to this commitment has not yet been established. The authorities' latest forecast estimates that already quantified climate measures would deliver a reduction of 28 percent during 2005–2030 (2,261 kt CO2e), which suggests that more measures would be required to achieve their commitments (Government of Iceland, 2022). Under the Kyoto Protocol, Iceland was granted allowances for 15 million tons of CO2 for the period 2013–2020, whereas, net of carbon sequestration, Iceland generated 19 million tons outside the ETS. The fiscal cost of missing this target is yet to be determined.

7. The strategy to reduce domestic emissions is sound. Iceland has prepared a comprehensive climate action plan, updated in 2020, which contains 48 actions cutting across key aspects of economic activity and sectors of society. It includes a combination of fiscal incentives, government regulation, and provision of infrastructure to encourage activities and the use of technologies that reduce Iceland's carbon footprint. The measures need to be periodically adapted to include technological and economic developments, and progress toward the objectives is envisaged to be measured periodically to adjust the pace of reform as needed (Ministry for the Environment and Natural Resources, 2020 and 2021). Achieving carbon neutrality would entail upgrading the capital stock toward one that produces less emissions, using cleaner energy sources and securing their supply, encouraging activities that generate less emissions, and expanding emission-absorbing activities, including through new technologies (Box 1).

D. On the Road and Fishing for Lower Emissions

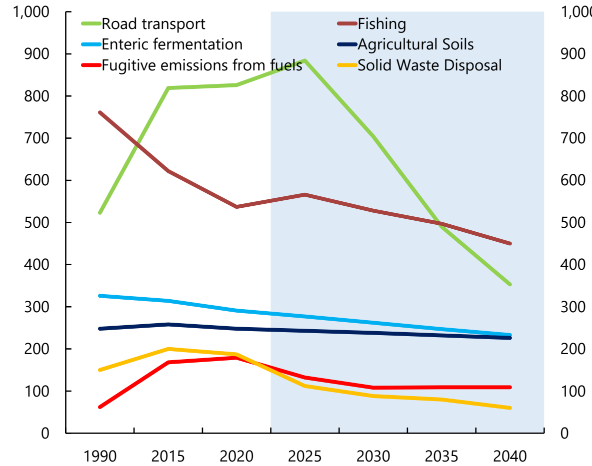
8. The Icelandic climate action plan recognizes that progress in reducing emissions from road transportation and the fishing fleet would be crucial to achieving Iceland's goals. Significant progress has been achieved in the last 25 years in reducing the emissions of the fishing fleet, The consolidation of the fishing quota system resulted in a reduction in the number of vessels, the use of larger ships, and a more sustainable and lower catch (OECD, 2021a, Government of Iceland, 2021a). However, the latest official forecast suggests that only moderate progress is expected in the next 20 years. The challenge is partly due to the young age of the existing vessels that consume the most energy but are otherwise efficient in getting the most catch (DNV Maritime, 2021, Government of Iceland, 2021a). In contrast, over the last 20 years, very little progress has been made in reducing overall emissions from road transportation. This is the sector, where most of the progress in reducing emissions is expected to take place in the future, as energy exchange in vehicles is already taking place.

Iceland: Other Emissions
(C02 Tons Equivalent)



Source: Statistics Iceland

Iceland: Non ETS Emissions Official Forecasts
(C02 Tons Equivalent)

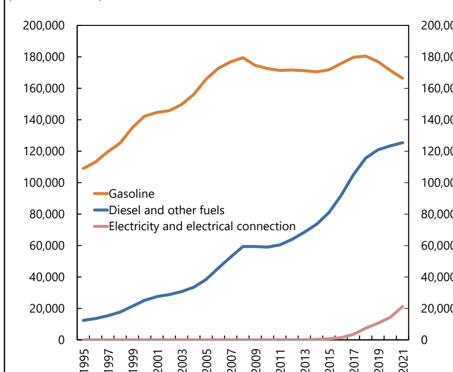


Source: Statistics Iceland

E. The Energy Exchange Transition Toward Clean Vehicles

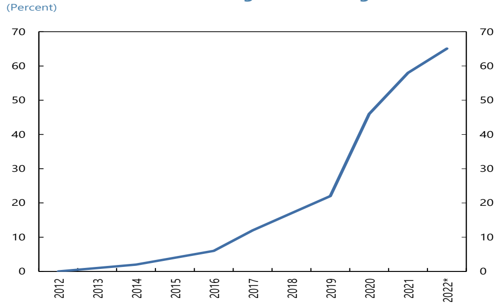
9. The emissions from road transportation have been relatively stable despite a significant increase in the number of vehicles, mostly reflecting substitution among fossil fuels. The share of gasoline in road transportation has declined from almost 60 percent in 2008 to about 30 percent in 2020. Most of the decline has been absorbed by diesel vehicles. The number of electric vehicles has increased since 2017, but they remain a very small fraction of the outstanding vehicle stock. Most of this substitution has taken place at the level of household vehicles, as the share of diesel cars has increased to 35 from 8 percent during 1995–2020. Of all diesel cars, the households' share has remained stable at about 70 percent. Most heavy transportation is diesel.

Iceland: Vehicles by Fuel Type
(Number of units)



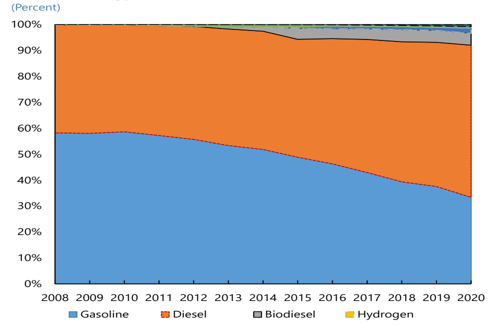
Source: World Bank Dashboard.

Iceland: Share of New Passenger Vehicle Registration
(Percent)



* Through April 2022.
Source: Ministry of Finance.

Iceland: Energy Used in Road Transport
(Percent)



Box 1. What Needs to Take Place to Reduce Net Emissions and Related Challenges: A Conceptual Framework

Four types of processes will assist in reducing greenhouse gas emissions, either jointly or separately: (1) upgrade the capital stock with embedded technologies that produce less or no emissions; (2) switch toward cleaner sources of energy and procure their supply; (3) reduce economic activities that generate emissions or increase others that generate low ones; and (4) absorb the emissions generated by other processes. Energy exchange requires the first two, but they can both be independent, for example upgrading the capital stock with more energy efficient technologies that use the same fuel.

The key challenge is that these processes take time to develop. Climate goals are set decades in advance because an immediate substitution of the capital stock is neither feasible nor desirable. It may be too expensive to acquire new capital and difficult to dispose of existing one. Gradual substitution can help ensure

the replacement of the capital stock that has already been fully depreciated with other that uses cleaner technologies. This implies that the speed of substitution of the capital stock depends on its average life span, which, for instance is lower for cars (12–15 years) than for fishing trawlers.

Moreover, there are technological and economic viability limitations. Energy exchange may not be feasible at the current level of technology. Alternatives to fossil fuels may be too expensive even after accounting for the adverse cost of climate disruptions, may not yet be easily available, and may require acquiring capital stock with early technologies, that may be soon obsolete, or may not competitive. Methods to absorb emissions are already technologically feasible, but not yet economically viable.

Energy exchange requires significant investment and capacity expansion. Maintaining reliance on renewable energy and fostering a substitution away from fossil fuels in transportation, would require investments in additional renewable energy infrastructure that may bring about environmental tradeoffs, such as the risks of environmental damage that may arise from the construction of hydroelectric dams.

Financial flows are crucial in energy transition. Financial flows (and stocks) have been involved in the capital stock being currently used in the generation of value added that currently generates the level of emissions that need to be reduced. These need to be redirected to help with the transition toward capital stocks that produce less emissions as the current capital stock depreciates in in generational waves and replaced with newer technologies over time. These changes add to the climate risks that financial institutions face. Not only do financial institutions may be affected by the materialization of losses from natural disasters associated to climate change, but they may also be affected by the risks of a too rapid transition of technological change.

Economic activities that generate significant emissions, such as aluminum smelters, may be a crucial source of revenue and foreign exchange for the economy that may not be easily substituted for other reliable income streams without lowering the net income of the population. On the other hand, industrial policy could help promote low emission activities.

Finally, Iceland's growing economy and relatively high population growth, including through immigration, would increase demand for resources and economic activity. This could result in higher emissions even if these were to fall in per-capita terms or per unit of economic activity.

10. **Although diesel vehicles have helped keep emissions from road transportation contained, the advantages of diesel over gasoline vehicles are not clear cut.** Diesel has a higher carbon content than gasoline per gallon. However, per unit of energy (BTU), diesel generates less

greenhouse gas emissions than gasoline. Because they achieve greater mileage per gallon, diesel vehicles on average generate about 40 percent less emissions than gasoline vehicles of similar weight (Nieuwenhuis, 2017). Although diesel vehicles generate less C02 emissions per mile, they also generate other emissions that have been associated with heart disease (Neophytou, 2019) and cancer (American Cancer Society, 2015).[1] Based on these concerns, many cities in Europe have banned the circulation of diesel vehicles. Although new generations of diesel vehicles will address these concerns in the future, Iceland has taken the decision to shift toward electric vehicles and the action plan envisages a ban on the registration of fossil fuel-dependent vehicles by 2030. Several other countries have announced similar plans, including Norway—by 2025—, Ireland, Netherlands, Slovenia, and Sweden—by 2030—, Cape Verde, Denmark, United Kingdom—by 2035—, France, Spain—by 2040— (International Council of Clean Transportation, 2021). Ongoing discussions at the European Union level could support a ban on the 27-country block by 2035.

11. The ban on fossil fuel vehicles and adoption of electric vehicles will sharply reduce the emissions from road transportation. By 2021, the stock of electric vehicles amounted to about 4 percent of the total stock, plug-in hybrids amounted to 6.5 percent of the stock, and the share of electric vehicles in new registrations to 58 percent. Iceland's high urbanization rate and relatively low driving ranges within the urban areas make electric vehicles well suited for the typical driver. The macroeconomic effect of a shift toward electric cars has been assessed as positive (University of Iceland and Reykjavík University, 2018). The shift toward electric vehicles helps with energy security and reduces dependence on the evolution of global oil prices. Iceland's current energy policy through 2050 sets energy exchange in transportation as a key medium-term policy objective (Government of Iceland, 2020a). This would imply a reduction in fuel imports, but for a time would require higher imports of capital goods to increase the supply of renewable electricity and investment in infrastructure to charge vehicles on the road. Given the typical life span on cars (12–13) years, the transition toward electric cars should be well advanced by 2030 at the current pace of new registrations. The use of electronic fuels is technologically feasible, but not yet economically viable (Box 2). It would eventually play a crucial role in supporting the reduction in emissions of heavy transport.

12. The prohibition of fossil fuel-dependent vehicles as of 2030 may need to be complemented over time with other measures. The prohibition to register new fossil fuel vehicles could help achieve climate goals but could lead to the use of obsolete fossil-fuel dependent vehicles well after they have depreciated. This greater reliance on old vehicles, on the margin, may tend to increase emissions. To a significant extent, this depends on the cost of new electric vehicles by 2030, which will likely continue to decline with technological improvements. But, if the cost does not fall fast enough, and it is not possible to obtain new fossil fuel vehicles after 2030, there could be stockpiling ahead of the prohibition, and individuals may tend to keep older vehicles for longer. This would require incentives to keep such vehicles well maintained, and to invest in mechanisms to keep their emissions from increasing.

[1] Chronic ischemic heart disease is the main cause of death in Iceland, although the number of cases has been on the decline since the mid-2010s.

Box 2. In Search of Electric Fuels for Energy Exchange

The quest for a renewable low-carbon portable fuel source for transportation in land, sea, and air is at early stages. Electric cars store electricity in batteries that release the energy to move the vehicle. Similarly, electric fuels (e-fuels) convert renewable electricity into a low-carbon fuel that could be used in combustion. In this way, e-fuels can store renewable energy as batteries. E-fuels already produced in Iceland at low scale include green hydrogen, methane, and methanol. The possibility to produce ethanol and biodiesel is also being explored. Nevertheless, the cost of production of these fuels is very high relative to that of fossil fuels, or even batteries. Similarly, vehicles that use e-fuels tend to be more expensive than other vehicles. In the case of hydrogen, the energy use of the electrolysis to produce the hydrogen from water costs more energy than the energy stored in the hydrogen. It can nevertheless make sense to produce green hydrogen during periods of excess electricity power that would otherwise be lost, or when mobile energy is twice more valuable than energy on the grid (Rapier, 2020).

At the current level of technology, it does not seem viable to expand renewable electricity capacity to produce e-fuels, but it may become viable in the future. The e-fuel option is currently expected to become competitive between 2030 and 2040 (Government of Iceland, 2021b). The use of renewable energy to charge batteries or produce e-fuels may require expanding the generation capacity of renewable energy. Such an expansion will need to balance environmental concerns with the benefits of reducing emissions in road transportation.

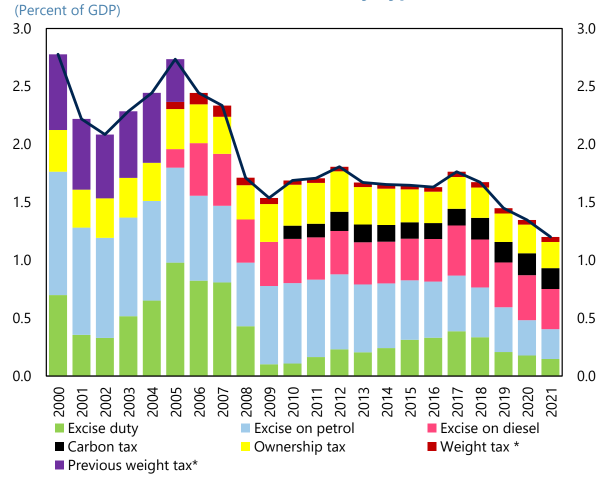
F. Fiscal Incentives to Reduce Emissions in Road Transportation

13. The strategy to encourage a reduction in emissions from road transportation is adequately comprehensive. A good strategy should factor not only the substitution of the vehicle fleet for more efficient means of transportation, but also consider options for public transportation that reduce the number of emission-generating units on the road, traffic congestions and related time costs (Arregui and others, 2020, International Monetary Fund, 2020 Box 4). To this end, the authorities' strategy already includes fiscal incentives encouraging the transition onto electric vehicles, initiatives to significantly enhance public transportation, provision of public infrastructure in the form of rapid charging stations and promotion of walking and cycling activities where feasible to support the transition (Iceland's Ministry for the Environment, Energy, and Climate, 2022). An expansion in the renewable energy capacity may be required.

14. Fiscal incentives to meet climate goals need to be revenue neutral and factor other fiscal objectives. The incentives need to be sustainable and apply to the acquisition, ownership, and use of the capital stock used in transportation. The incentive structure needs to (1) favor the use of clean energy over other types of fuel, and (2) meet other road transportation objectives, such as achieving an optimal number of cars on the road, encouraging the periodic renewal of the car fleet, and allowing for maintenance and safety of the road infrastructure. The wedge in taxation of vehicle acquisition, ownership, and use should favor cleaner technologies and fuel use, but should be set at a level that still raises enough revenue to achieve other policy goals in addition to energy transition. The authorities already recognize this challenge and are considering different taxation structures (Ministry of Finance and Economic Affairs, 2018 and 2022).

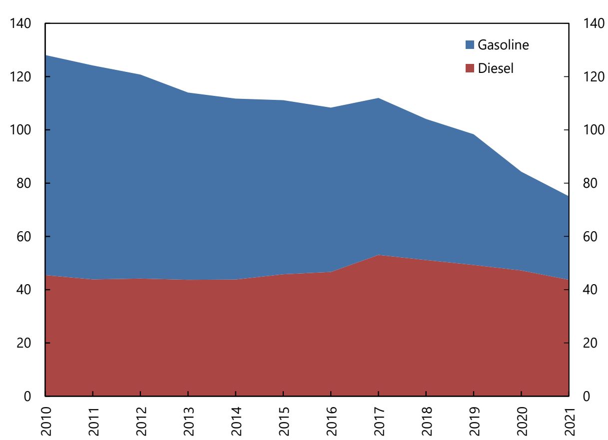
15. The current incentive structure related to vehicle taxation is contributing significantly to the adoption of electric cars but is not sustainable. The current tax incentive structure for clean vehicles resembles the one prevailing in Norway, with similar effectiveness in encouraging electric vehicle adoption and some of the same fiscal challenges and room for improvement (OECD, 2021c Box 15 and ¶74). Taxes or fees are already applied on the acquisition of cars and have been tied to the emissions they are expected to generate during their economic life span. Tax exemptions have also been granted temporarily from some type of taxes to encourage adoption of capital stocks with cleaner technologies. These include VAT exemptions for clean vehicles and temporary accelerated depreciation rules for eligible green investments affecting corporate income tax colletions. Similarly, taxes are already applied to the carbon content of different types of energy sources, which has taken the form of a carbon tax applied to the carbon content of each fuel. Similarly, depreciation rates for tax purposes can also be calibrated, in principle to factor in the carbon content of different technologies and could be used to accelerate the replacement of capital stock with older carbon intensive technologies. Nevertheless, the structure is not sustainable because the tax base of fossil fuels will disappear once the transition has been completed. Tax revenue from vehicles has been declining over time, more recently with the ongoing substitution away from fossil-fuel vehicles. Changes in the tax structure would need to take place at the level of usage to transition from taxing the energy to a more direct measurement of actual use.

Iceland: Tax Revenue from Vehicles, by Type of Tax (non VAT)
(Percent of GDP)



* on heavy diesel vehicles.
Source: Ministry of Finance.

Iceland: Excise Revenue per Total Number of Vehicles in Circulation
(Thousands of kronas of 2021)



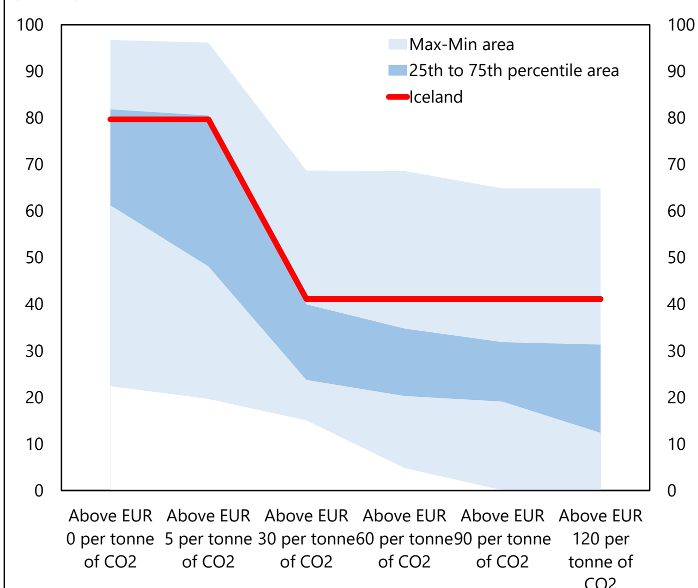
Source: Ministry of Finance.

G. Realigning and Broadening the Base of Energy Taxation

16. The relative prices of alternative fuels play a role in the choice of vehicle types. They appear to have played a role in the transition toward diesel cars. Per liter, pump prices for diesel are generally lower than those for gasoline in Iceland. Diesel is cheaper to produce than gasoline, and in Iceland carries lower taxes. Although diesel carries a higher carbon per gallon tax than gasoline due to its higher carbon content, overall taxes end up being lower due to lower excises. For diesel and gasoline, the size of excise taxes is significantly larger than the corresponding carbon tax (OECD, 2019). As a result of the high taxes on gasoline and diesel, prices of gasoline and diesel are among the highest in the world. Electricity is not subject to excises or carbon tax, but it is subject to value added tax: Electricity for house heating is taxed at the lower VAT rate (11 percent) and other electricity at the standard VAT rate (24 percent).

17. High taxation of fossil fuels plays many roles other than discouraging their use. It is a way of charging for the public use of roads and a substantial source of revenue. To the extent that energy exchange in transportation were successful, and fossil fuels are taxed and electricity (or other alternative fuel sources with little carbon content, such as e-fuels) is not, the state would lose a nontrivial amount of fiscal revenue. Taxing electricity and e-fuels to the levels compatible with public services related to road transportation, such as road maintenance, security services, traffic control, among others, would be a way to replace the tax base after the transition. Other ways of charging for road usage, other than through the taxation of fuel sources, would need to be developed while maintaining the tax wedge between fossil fuels and clean sources of energy. Experiences with this type of usage charges are being considered by the authorities (Ministry of Finance and Economic Affairs, 2018).

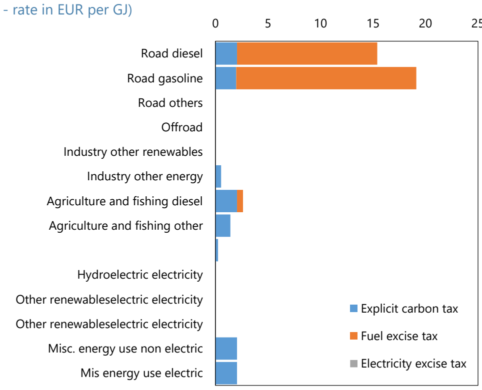
Iceland: OECD - Share of Carbon Emissions Priced
(Percent)



Source: OECD

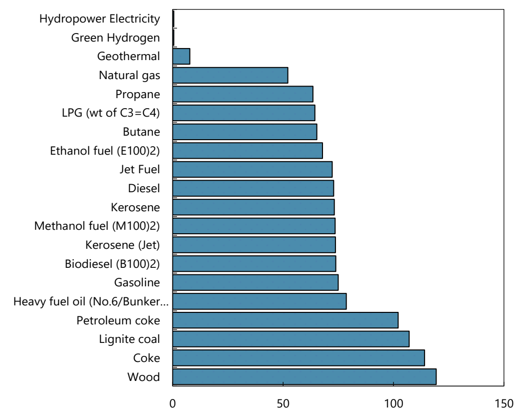
18. To keep climate objectives, the explicit carbon tax coverage would need to be made universal or widely expanded. Climate goals require further shift toward cleaner energy fuels. This requires ensuring that different types of energy sources pay according to their carbon content. In practice, this would mean, for example, that diesel would pay more than gasoline because it has a higher carbon content, even if it were to generate less emissions per mile. The coverage of carbon prices should in principle be universal as emissions harm the environment independently of their source. This is also more equitable, sharing the burden of meeting climate goals across all sectors of activity that generate the emissions. Although the coverage in Iceland can be expanded, effective carbon pricing scores suggest Iceland fares comparatively well in terms of carbon pricing coverages around the world (OECD, 2021b). Expanding its coverage across the whole spectrum would include emissions from electricity generation, which would apply in practice mainly to those produced by geothermal energy. Although geothermal emissions are lower per unit of energy, they have increased substantially and need to be adequately priced. The capture of C02 emissions from geothermal energy could in principle be used as a credit to this tax (Government of Iceland, 202b). Care should also be taken to avoid double taxation of emissions from the industries subject to the ETS, as these already pay directly for the emissions they generate, factoring their free allocations to protect some industries from carbon leakage. For basic metals, the main energy input is renewable electricity, so the scope for double taxation is in principle small.

Iceland: Effective Energy Taxes by Sectors
(Average by sector, energy category and end-use energy (electricity or other) - rate in EUR per GJ)



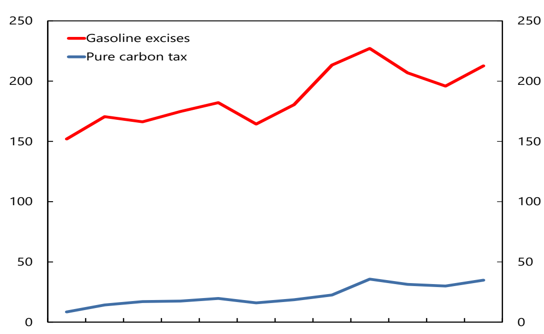
Source: OECD. Taxing Energy Use

Iceland: Fuel Cleanliness
(Kilograms of C02 per Million Btu)



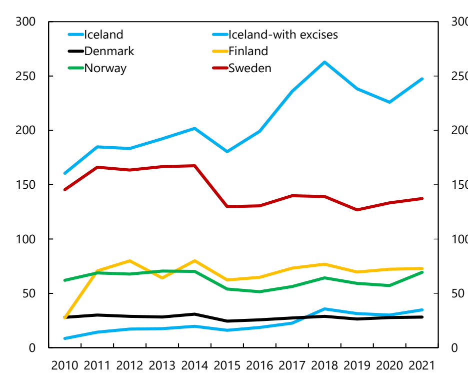
19. Carbon taxes would also need to be significantly raised. Together with the expansion of coverage, raising carbon taxes would better align climate incentives across industries (International Monetary Fund, 2011). In terms of economic impact, increasing carbon taxes would affect fossil fuels used in the fishing fleet, which will help with the energy transition. Fuel excises are already a form of carbon taxes, that forms part of the effective tax on these energy sources. Increasing carbon taxes to the level of effective energy taxation of gasoline (carbon tax plus excises) and eliminating excises would leave carbon taxes in Iceland the highest in the word.

Iceland: Carbon Taxes
(US$/tCO2e)



Source: World Bank Dashboard.

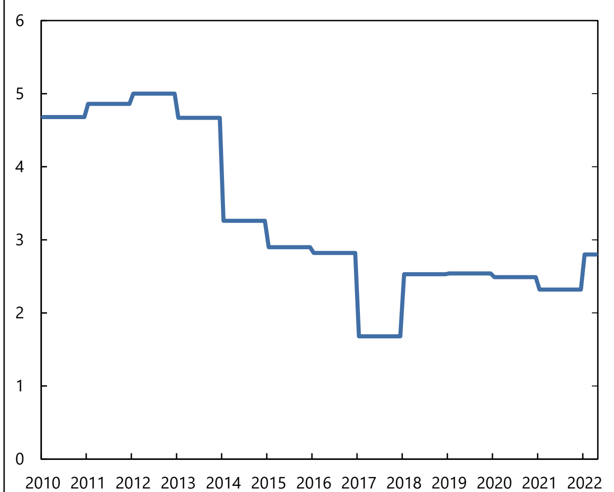
Nordic Countries: Carbon Taxes
(US$/tCO2e)



Source: World Bank Dashboard.

20. The impact of these changes need not significantly affect the consumer. In the event that carbon taxes are raised to the level of effective taxation of gasoline (with offsetting changes in excises), the overall level of energy taxation in road transportation would not materially change for individuals with a gasoline vehicle. Effective taxes would increase for diesel users as excises for diesel are currently lower than those for gasoline. Although gasoline and diesel are among the most expensive in the world, the cost of living in Iceland and incomes are generally high. The share of gasoline prices in the consumer price index, for example, has declined to below 3 percent. The higher taxation of fuel in the fishing fleet may increase on the margin the price of fish, but most of it is exported. Formal studies reach a similar conclusion that the impact on consumer prices and consumer purchasing power will be mild (Blöchliger, Johannesson and Gestsson, 2022; Institute of Economic Studies, 2019 and 2020; OECD, 2021).

Iceland: CPI Weight of Gasoline Prices
(Percent)



Source: Statistics Iceland

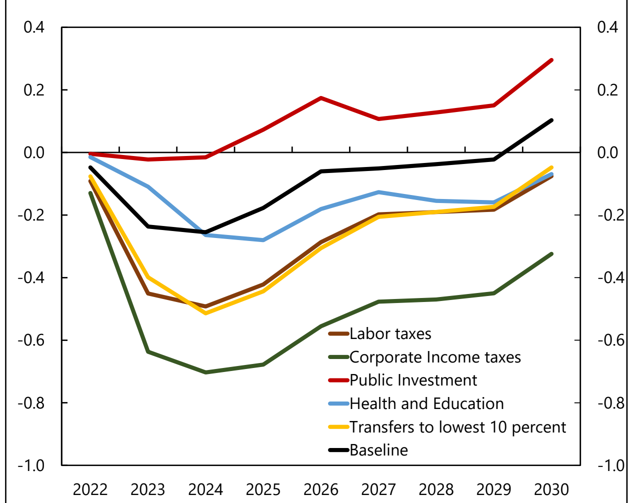
H. Insights from the Climate Policy Assessment Tool

21. The Climate Policy Assessment Tool is a benchmark for assessing climate policies around the globe. The IMF/World Bank Climate Policy Assessment Tool (CPAT) is a spreadsheet model that has been used to study the effects of climate mitigation policies in several flagships of the multilateral institutions and in the bilateral surveillance of member countries (Black and others, 2022; IMF-WB, 2022; Parry and others, 2018).

22. Simulations for Iceland suggest that, if the only policy to achieve climate goals were carbon prices, these would need to be increased further. This would depend on what happens to fuel excises. If gasoline and diesel excises were kept at their current levels, carbon prices would need to increase to about US$ 220 per tCO2e from 37 US$ per tCO2e to engineer a reduction in emissions of 40 percent with respect to their 1990 levels. In the absence of measures, emissions would grow with economic activity. Under the baseline carbon tax simulation in Panel 1, which assumes that the increase in carbon price takes place in 2023, the model suggests this would imply an increase of about 70 percent relative to 2018 CPI-adjusted gasoline and diesel prices. The year 2018 is used as reference because the model uses a cross-country dataset, whose latest observation is that year. Different combinations of fossil-fuel excises and carbon tax increases are possible to achieve this goal but are likely to require significant increases in the real price of fuel relative to their 2018 levels. Because Iceland does not rely exclusively on increasing carbon prices, this estimated increase in prices associated with higher effective taxation of carbon emissions should be viewed as an upper bound.

23. The envisaged increase in carbon taxes in the baseline would hurt GDP growth temporarily but has a net positive welfare benefit. The impact on GDP would depend on how the tax revenue raised from the increase in the carbon tax will be used. The envisaged increase in carbon prices would add about 1 percent of GDP in fiscal revenue. The baseline assumes that half the revenues are used to reduce labor taxes and the other half to increase public investment, which impact economic activity through fiscal multipliers. The model tool suggests that in the baseline the increase in carbon taxes would slow GDP growth by about 0.25 percentage points in 2023–2024, but the net effect on the growth rate (not the GDP level) would disappear by 2030. The model recognizes that tax increases may have efficiency costs, but suggests that the net benefit may be positive, not only because of their effect on climate, but also due to improving health with lower air pollution and lowering congestion and, with lower vehicle circulation, accident death (Figure 1).

Iceland: Net Impact on GDP Growth of Carbon Tax Increase[1]
(Percent)



1/ Using 100 percent of fiscal revenue for reducing tax types or increasing spending.
Source: IMF/World Bank Climate Policy Assessment Tool (version CPAT 1.0pre_097)

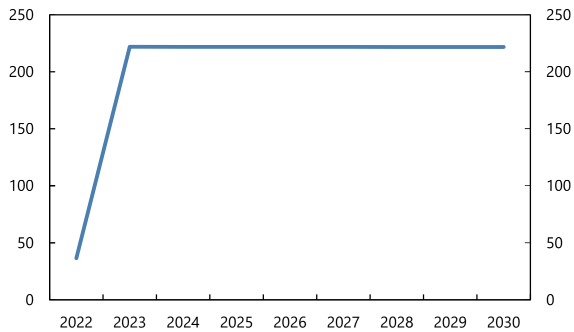
24. The pace of carbon price increases affects the profile of the impact on economic activity. Raising carbon prices immediately to a sufficient level to achieve climate goals with the current level of technology would imply unnecessary disruption in economic activity and social welfare. Partly because of this, climate goals are set to be achieved over a long period. Arguably, the increase in carbon taxes should be in preannounced stages to avoid unnecessary disruptions and to discourage fast adoption of earlier technologies that may soon become obsolete, or that end up affecting public health. Nonetheless, the CPAT model highlights that while the impact on GDP growth will be more stable, it would tend to be negative for longer. This is because the economic benefit from the alternative uses of the fiscal revenue—lower labor taxes and higher public investment under staff's baseline—would materialize later.

I. Carbon Absorption to Net Down Emissions

25. In addition to reducing carbon emissions, reaching carbon neutrality would require absorbing some of the emitted c02 (carbon sequestration) through a variety of means. This involves efforts at afforestation, wetland restoration and protection, land reclamation, and more innovative means that are at early stages of technologic development and economic viability. It remains unclear if land reclamation offsets, though valuable, should count a credit for emissions, as land emissions are not counted, and would be subject to a different set of international standards and commitments. A variety of carbon capture and storage technologies are being developed. For relatively concentrated sources of CO2 emissions, such as from geothermal steam or silicon production, it is now feasible to capture the greenhouse gas emissions and convert them either to rock or to green methane. The gas-to-rock method of Carbfix is already applied to geothermal

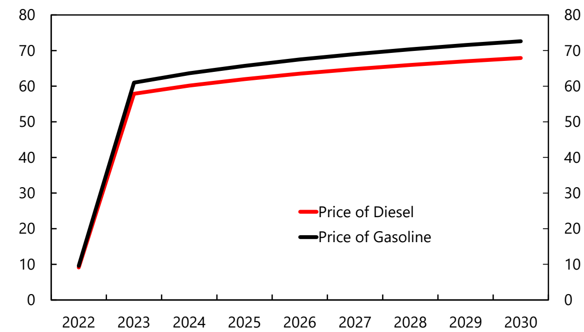
Figure 1. Iceland: Climate Policy Assessment Tool Baseline Simulation: 2022–2030

Carbon Tax
(US$ per tCO2e)



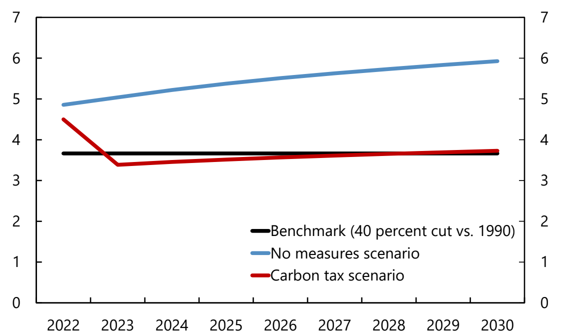
Source: IMF/World Bank Climate Policy Assessment Tool (version CPAT 1.0pre_097)

Cumulative Increase in Fossil-Fuel Prices
(Percent, relative to 2018 CPI adjusted prices)



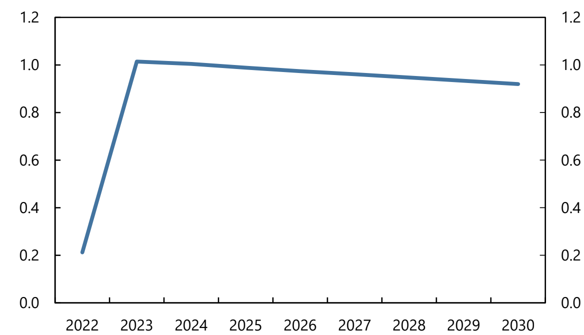
Source: IMF/World Bank Climate Policy Assessment Tool (version CPAT 1.0pre_097)

Greenhouse Gas Emissions
(mtCO2e exc LULUCF)



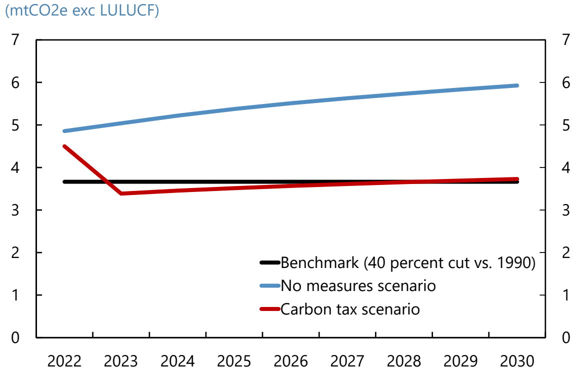
Source: IMF/World Bank Climate Policy Assessment Tool (version CPAT 1.0pre_097)

Fiscal Revenue from Carbon Tax Increase
(Percent of GDP, deviation from baseline)



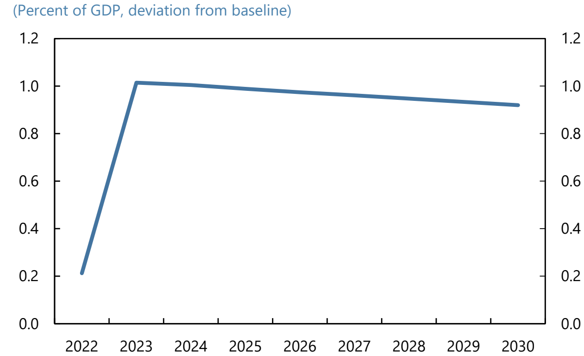
Source: IMF/World Bank Climate Policy Assessment Tool (version CPAT 1.0pre_097)

Greenhouse Gas Emissions
(mtCO2e exc LULUCF)

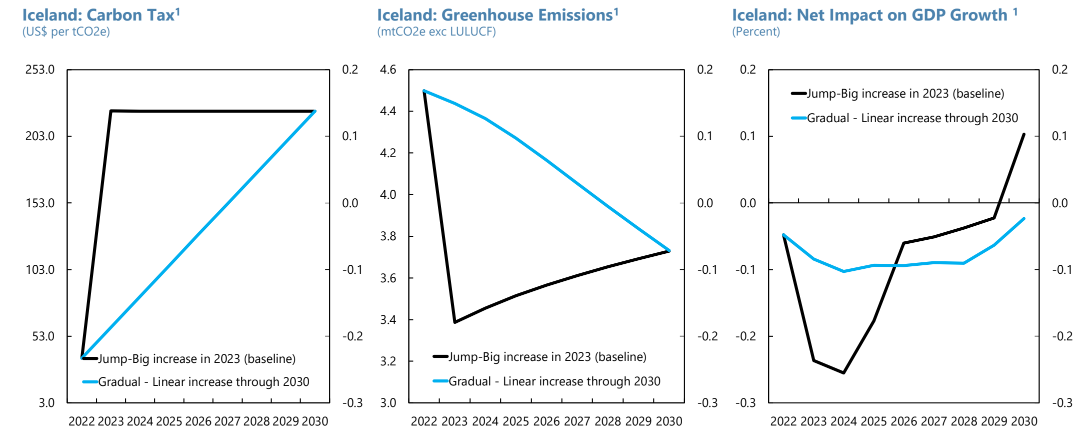


Source: IMF/World Bank Climate Policy Assessment Tool (version CPAT 1.0pre_097)

Fiscal Revenue from Carbon Tax Increase
(Percent of GDP, deviation from baseline)



Source: IMF/World Bank Climate Policy Assessment Tool (version CPAT 1.0pre_097)



1/ With half marginal revenue reducing labor taxes and half raising public investment.
Source: IMF/World Bank Climate Policy Assessment Tool (version CPAT 1.0pre_097)

emissions and the feasibility to expanding it to other areas is being studied (Veal, 2020, Government of Iceland, 2022). Methods to capture CO2 directly from the air (Orca from Climeworks) have been used since 2020 in combination with mineral storage technology, such as CarbFix to contribute to offsetting some of the emissions. The gas-to-green methane option is currently being studied by the national electricity company and silicon producer PCC SE at Bakki. These methods are technologically feasible, but not yet economically viable on mass scale (Government of Iceland, 2021b).

J. Conclusions

26. Iceland's climate goals are appropriately ambitious given that its average levels of emissions per capita and GDP are above the median of the OECD. Although Iceland has the lowest emissions in energy generation in the OECD, it does not fare well in other areas. While the authorities' goals rightly focus on emissions under domestic regulation, the authorities should not lose sight of emissions under the European ETS, which have accounted for most of the growth in emissions in Iceland since the 1990s. The country's extensive reliance on renewable energy could attract high-energy intensive firms, which could reduce European greenhouse gas emissions but will end up increasing those in Iceland. The expansion of energy-intensive sectors should be assessed with care, taking into consideration environmental concerns, economic viability, international commitments, and public health implications.

27. Meeting the ambitious climate goals on the non-ETS front will be challenging in a growing economy and would require continuous determination and effort to advance the pace of technological development. Energy exchange in road transport and fishing will benefit from uniform carbon pricing policies, realigning the energy taxation base, and large expansion or redirection of renewable energy production. Fiscal incentives need to be revenue neutral and factor other fiscal objectives. They will need to maintain a gap favoring cleaner technologies while being set at a level high enough to support other fiscal objectives. In road transportation, these incentives should apply at the level of car acquisition, ownership, and usage. The largest reform may need to take place at the level of usage with the transition toward cleaner technologies reducing the tax base on fossil fuels, through which vehicle usage has traditionally been taxed.

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