



Two practical cases of blockchain for tax compliance

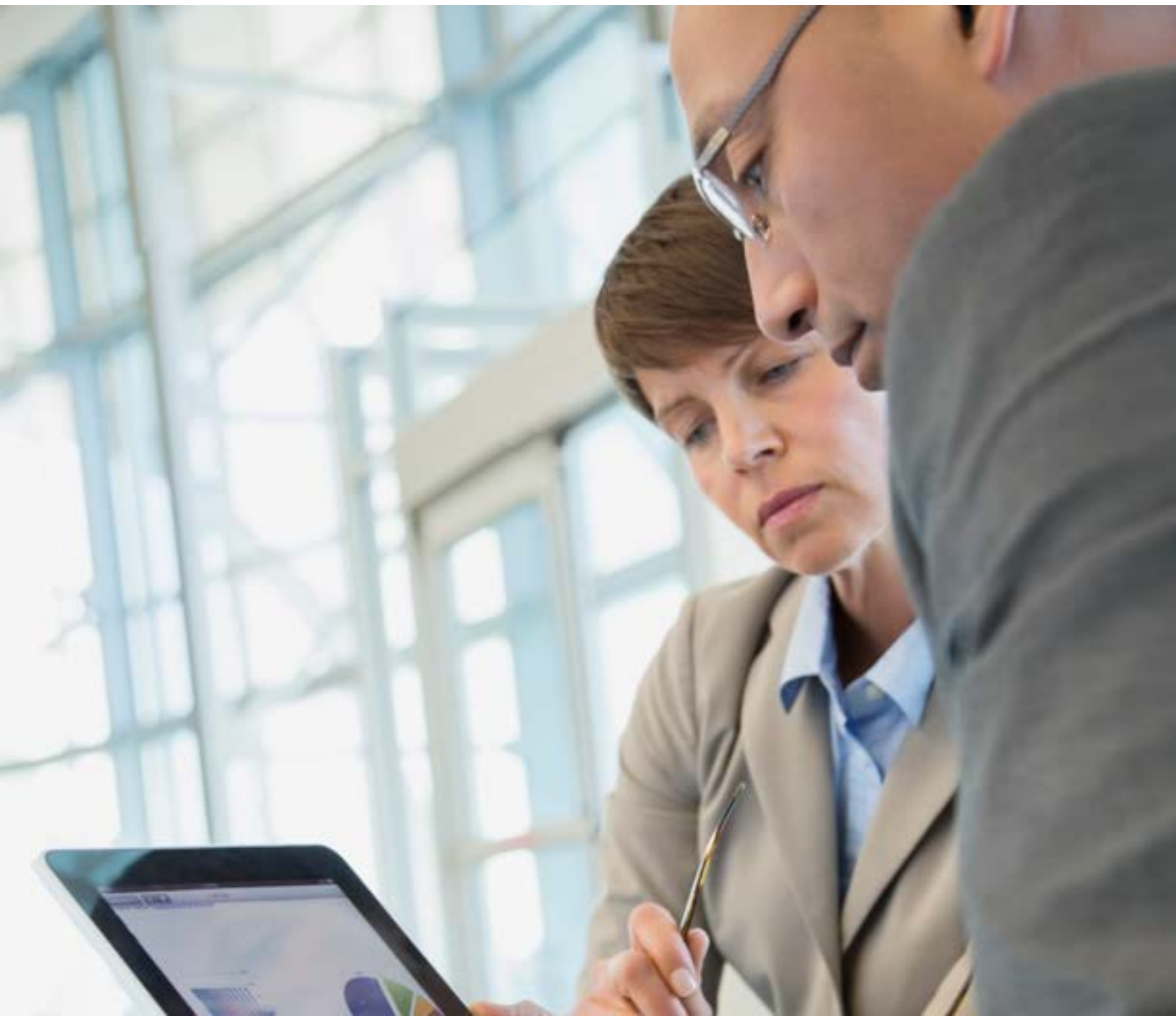


Table of contents

01. Introduction >
02. Two tax compliance scenarios that can benefit from blockchain technology >
 - VAT tax and blockchain >
 - The journey to a sustainable, blockchain enabled tax infrastructure for stimulating (eco)tourism development in countries >
03. The benefits of blockchain adoption for tax compliance >
04. Conclusion >

01.

Introduction

As we have seen in the part 1 of our whitepaper “**Blockchain for tax compliance**” there is a growing excitement around Blockchain and its potential to transform the tax system. It could have a significant impact on tax – the way people pay tax and tax administrations collect revenue. It creates a system where tax payments can be integrated within the business operations and become a by-product of each transaction. For example, Blockchain could significantly modernize the current VAT system.

There is a growing demand in the technology from many tax administrations worldwide and in Europe in particular in order to improve the tax compliance, reduce the cost of operations and make it easier for the taxpayers to comply. Speaking of tax compliance, the European Union is losing billions of euros in value-added tax (VAT) revenues because of tax fraud and

inadequate tax collection systems. The two best known tax gap estimates are the VAT gap in the EU, which is estimated at around €150 billion, and the US IRS gap, estimated at \$458 billion. With a combined total of European VAT and US IRS revenue totals of approximately \$4.6 trillion in 2016, the gap is 14%.¹

Blockchain technology has the potential to help close this gap. While in the first part of the whitepaper we have highlighted the considerations for implementing a government blockchain, the implications and benefits blockchain can bring in terms of tax compliance and shared our vision on the design of the journey to implementing blockchain-based tax compliance infrastructure, in the this whitepaper we aim to provide two concrete solutions to the question “**How exactly Blockchain can improve the tax compliance?**”

02.

Two tax compliance scenarios that can benefit from blockchain technology



VAT Fraud Prevention and Blockchain

The big question to answer today is: How can we prevent fraud and decrease costs of VAT compliance for tax administration agencies while building trust in the system and making VAT infrastructure transparent?

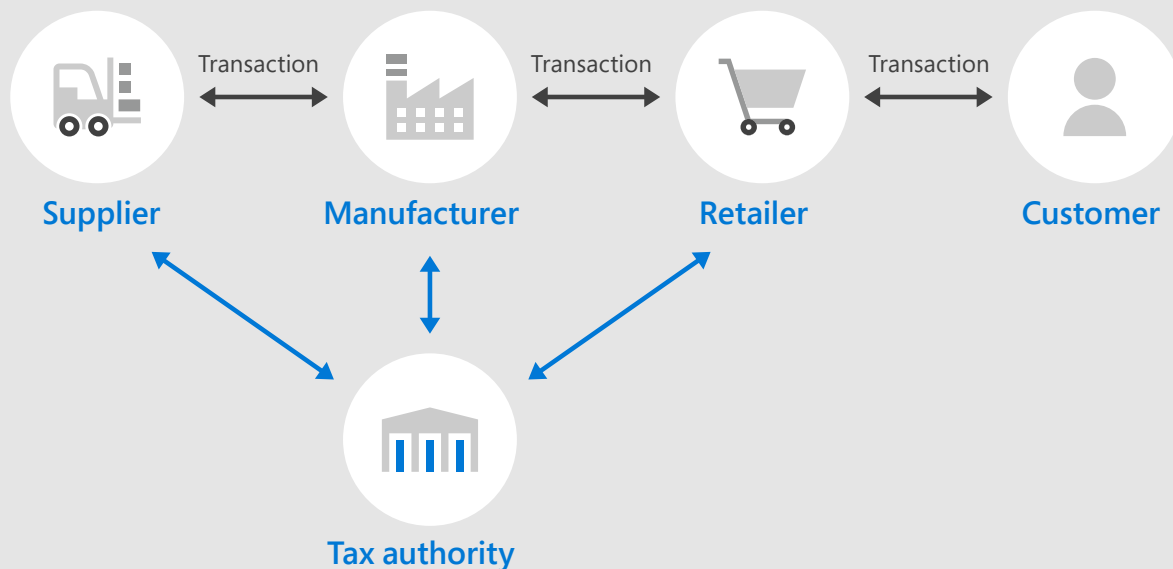
73% of respondents (over 800 business leaders) expect governments to start collecting taxes via blockchain by 2023.

[The World Economic Forum, 2015](#)

Blockchain has potential to significantly modernize the current VAT system. Blockchain enables automation of business rules by leveraging Smart Contracts, acceleration VAT refund and bringing efficiency in tax audits. It can complement the existing system by building a single transparent shared view of the data.

The issues we want to address with this use case are:

- Reduce fraud and decrease costs of compliance by tax administration agencies. The total amount of VAT lost across the EU countries is estimated to be around EUR 150 billion, with EUR 50 billion lost due to fraud.²
- Build trust in the system and make VAT infrastructure transparent.
- Reduce the information asymmetry problem between tax administration agencies and taxpayers.



Blockchain Value

Create transparency
Remove duplication and create visibility
across all stakeholders

Automate business rules by leveraging
Smart Contracts. Accelerated VAT refund.
Cancellation of tax audits

Complement the existing system
by building a single transparent shared
view of the data

Improved VAT collection
to the government budget

Less reconciliation will remove complexity
and compliance cost

Leverage Blockchain to create
trust to reduce the liquidity problem
for the companies

Any blockchain solutions in this area should address these issues by answering the following questions:

- How do we make sure that the person who creates the transaction is who he/she claims to be?
- How do we make sure that once the transaction is written, it cannot be tampered with or changed?
- How do we validate the transactions automatically?
- How do we make sure that anything that happens is captured so that we can audit it?
- How do we make sure that there is transparency without losing confidentiality?

The overall economic environment that tax administration agencies operate in is very complex. Implementing blockchain solutions requires determining whether blockchain is a useful solution, and if so, the solution requires careful planning and testing before being put into public use. For example, planners need to address how the users can scale the solution and maintain confidentiality. Planners also need to consider how the new processes will be defined in a distributed environment and how cross-organizational workflow will be modeled into smart contracts.

Microsoft and PwC partnered to develop a VAT Fraud Prevention Prototype based on Microsoft Blockchain Essentials solution and Microsoft Azure Blockchain Workbench. The prototype builds on PwC's business knowledge on taxation and Microsoft's technical capabilities experience on developing and deploying blockchain solutions on Microsoft Azure.

The VAT Fraud Prevention prototype is designed to enable implementation of blockchain technology in VAT Fraud Management in 3 phases:

Phase 1: Information exchange phase

The first phase focuses on the establishment of the blockchain as a trusted information exchange and logging platform, where all transactions are registered and exchanged between different stakeholders. Information exchange is critical to success in multinational environments (such as the EU) where establishing an architecture to exchange and share information between countries is a complicated task.

Phase 2: Real-time VAT phase

The second phase focuses on how smart contracts can resolve the liquidity problem of the real VAT scenarios. Smart contracts will be used to implement automated VAT payments between companies, automatically adjust VAT accounts of companies, automate the VAT returns from the tax administration agencies and minimize the administrative burden of the management of VAT processes for businesses.

Phase 3: Introducing cryptocurrency phase

The last phase is the most advanced scenario and foresees that tax administration agencies will adopt and regulate a crypto currency, so that B2B VAT transactions can be done using a cryptocurrency that helps automate and incentivize the consortium governing the VAT collection process.

The VAT Fraud Prevention Prototype has been designed to increase trust, promote transparency, eliminate fraud and reduce reconciliation efforts for society by leveraging the immutable, cryptographically signed and decentralized capabilities of blockchain.

The key attributes of the VAT Fraud Prevention Prototype are:

1. It is possible to operate in a multi-national business environment where businesses from different countries exchange invoices.
2. The Prototype splits companies into two groups: Whitelisted (WL) and non-Whitelisted (non-WL) companies. Whitelisted companies are members of a special registry consisting of companies that have elevated tax control policies and demonstrated high tax compliance. The system implements different workflows for WL companies and for non-WL companies.

WL companies have a deferral period for the VAT payment as a reward for their historical high VAT compliance and an incentive to be an early adopter of the Prototype.

3. All VAT payments are labeled and traced in the VAT ledger/trial balance. The trial balance is settled automatically at the end of the certain period (e.g., three months) through smart contracts, and then VAT is paid to the tax administration.
4. Banks are members of the consortium and all the transactions are implemented through the banking system.

The implementation of the blockchain-based VAT includes a range of stakeholders that are members of the consortium like:

- Tax administrations
- Corporate taxpayers
- Financial institutions/banks

The VAT Fraud Prevention Prototype enables business scenario that an e-invoice from the sales transaction between supplier and buyer to be used to record transactions on blockchain shared ledger with breakup of eligible VAT. The ledger ensures that data integrity is preserved and allows VAT fraud prevention. With blockchain solution, both tax authority and businesses gain benefits. Businesses can get immediate returns from tax administration, gain efficiency in capturing and reporting VAT transactions, file VAT returns more conveniently saving their firm a lot of time and money spent in administrative and accounting services.

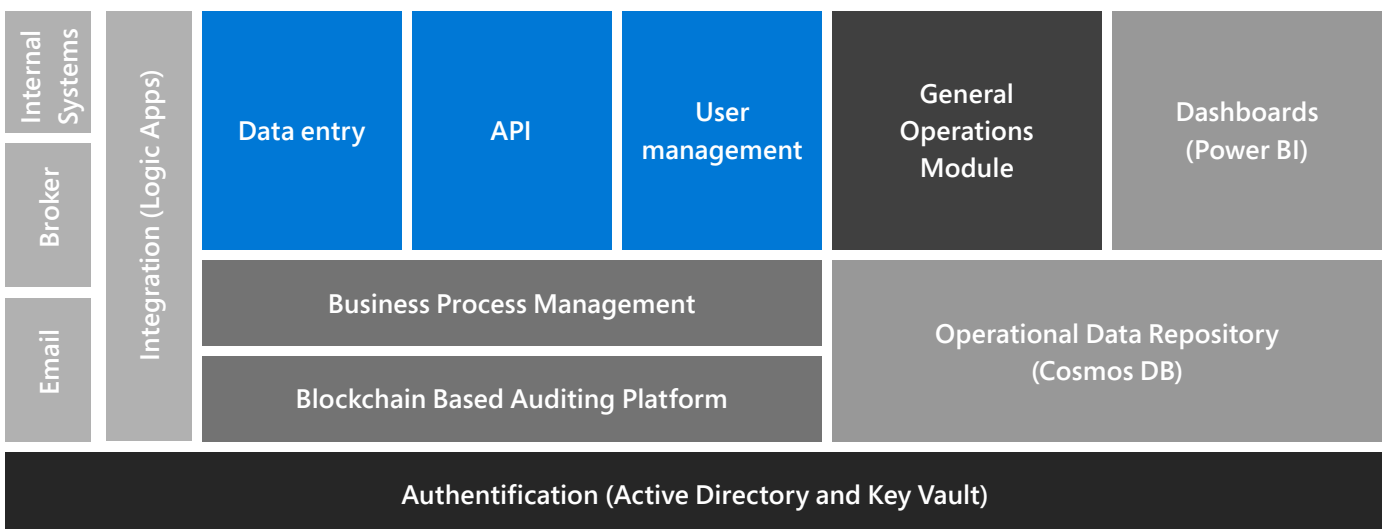
Tax authority can have real time access to VAT transactions, assess VAT compliance, get

reports on VAT collections – pending refunds and returns filed. With these greater insights, the tax authority can now better plan VAT collections, forecast revenues and cost of enforcement reduces significantly.

The implemented PoC has minimal complexity in terms of the encapsulated business processes and the VAT reconciliation tasks, and mainly aims to:

- Increase compliance by increasing the information exchange, especially at cross-country transactions, and provide a trusted platform where all transactions are logged.
- Establish the foundation layer toward the more advanced blockchain scenarios where cryptocurrencies can be introduced.

Figure Prototype: Solution Modules





The VAT Fraud Prevention Prototype has been implemented on Azure Blockchain Workbench platform and the modules of the prototype are presented in Figure P1.

The VAT Fraud Prevention Prototype:

- Includes 3 nodes of Ethereum Ledger;
- Provides storage for off-chain data;
- Provides API based on Node.JS, and will be able to run commands and get data from the system;
- Includes an AngularJS-based website, such as Service-Bus and Logic-Apps, to publish events and run code on certain events; and
- Uses Azure AD as the authentication and identity provider.

Evolution of digital VAT compliance

When imagining a vision of tax administration in 10 years, we expect blockchain technology will play an important role to empower tax systems and its stakeholders.



Direct tax (CIT or income tax)

- Public country-by-country reporting will become a common practice.
- Blockchain can help establish a global standard for tax reporting.
- Third-party tax assurance will be provided by regulated tax compliance providers.
- Blockchain can help increase the exchange of information between tax administrations through the use of cloud-based platforms for exchange of information.
- Blockchain can help facilitate multi-territorial joint audits by tax administrations (e.g., OECD's International Compliance Assurance Program/ Tax Inspectors without Borders) with an audit standard or Tax Control Framework.

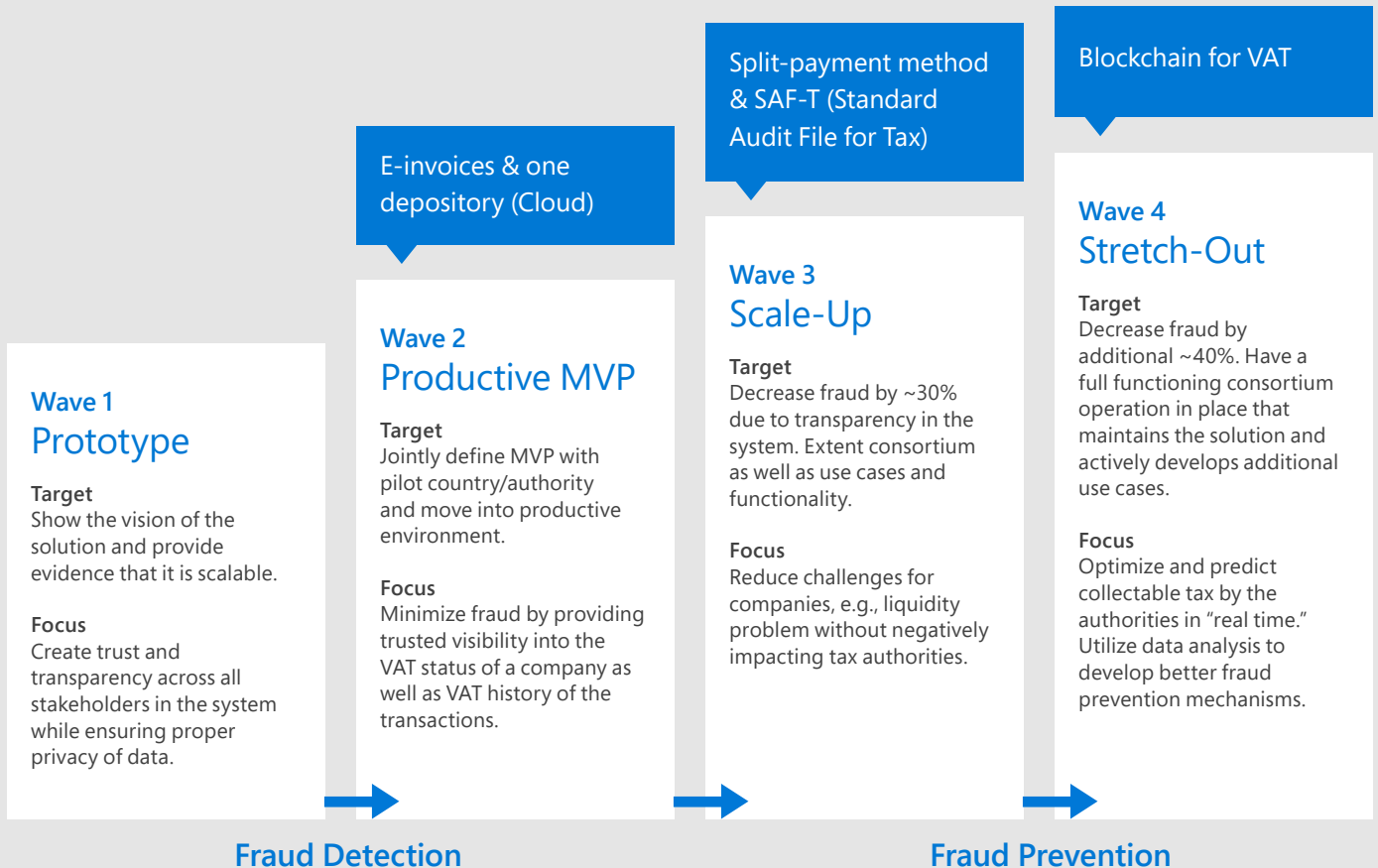


Indirect taxation (VAT)

- Split-payment systems can be combined with enabling technology for real-time compliance & auditing.
- Smart contracts can contain mandatory pre-described software for tax payers.
- Blockchain may help reduce the need for traditional tax returns filings.
- Blockchain may reduce the fragmentation of compliance processes at the country level (technology, language, controversy).

Implementing blockchain solutions for tax will be a journey and it requires preparation. The image below details the transformation journey and prerequisites for adoption of blockchain solutions. At a minimum, for Public Sector to implement blockchain solutions, they will need to (i) implement E-invoices, (ii) use one depository (Cloud), (iii) use a split-payment method to isolate VAT amount from the transaction amount and (iv) create a SAF-T (Standard Audit File for Tax). See image below for more details on each phase.

Evolution and Benefits of VAT Compliance:



**The journey to a sustainable,
blockchain enabled tax
infrastructure for stimulating
(eco)tourism development
in countries.**

Building a sustainable, technology-enabled tax infrastructure to benefit from existing, and to facilitate new eco-tourism initiatives in a country (or city)

The idea

By investing in blockchain to facilitate tax payment compliance of eco-tourism revenue, a country or local government may become more self-reliant and independent from third-party financial aid (from donor countries, banks or businesses) and work toward achievement of the UN Sustainable Development Goals (UN SDGs) 16 & 17.³

Why?

Tax is one of three main sources of income for a government — the other two are sale/lease of natural resources and government-issued loans. The sale/lease of natural resources does not provide a stable revenue stream, due to volatile global commodity markets. Loans are expensive and restrict “freedom of maneuver.” By comparison, governments can promote revenue stability by investing in a sustainable resource like eco-tourism and using blockchain solutions to help capture tax revenue related to the resource.

How?

A government will need to build and maintain the necessary infrastructure for eco-tourism, including:

1. Introducing an eco-tourism levy in the country at a rate that creates a meaningful sustainable income stream without becoming a disincentive for tourists to travel to that country.
2. Implementing blockchain enabled “smart contracts,” so that the levy is labeled and allocated directly to a special wallet at the national or local government level that is dedicated exclusively to eco-tourism initiatives, which may help mitigate against the risk of the tax money being used for other purposes.

3. Spending the budget primarily on eco-tourism initiatives, including restoration and maintenance of national parks and oceans, building eco-tourism infrastructure, preservation of local historic heritage sites, supporting local businesses who are primarily engaged in eco-tourism and educating local residents to become larger participants in the country's economy.

Building a sustainable tax infrastructure for eco-tourism initiatives requires a holistic and strategic approach, built upon the six pillars discussed earlier in this paper: strategy, legislative framework, operational framework, technological infrastructure, change management and performance measurement.

For whom?

National, state and local governments interested in using eco-tourism as a source of domestic revenue may wish to consider blockchain solutions.

Outcomes

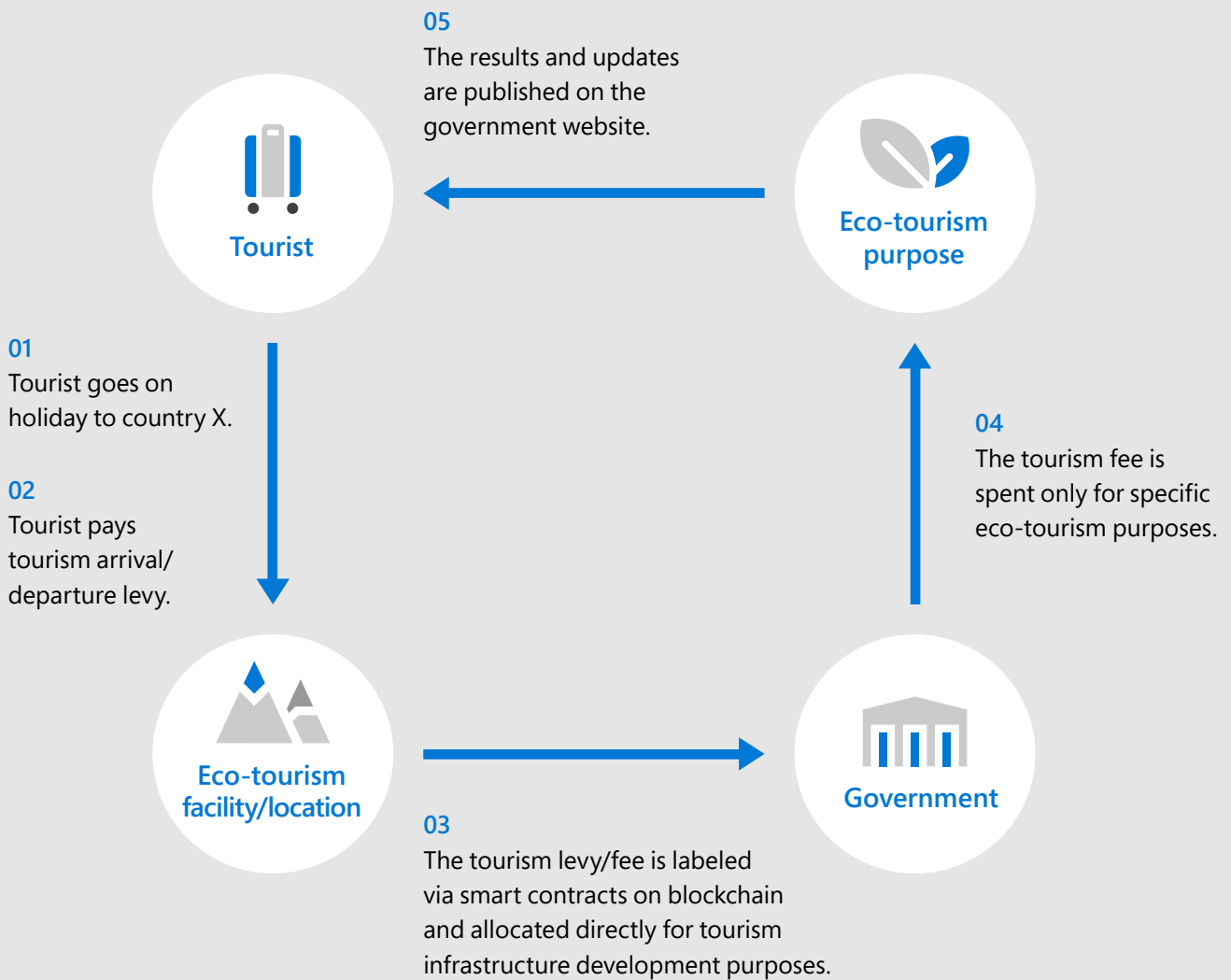
- Imposing a levy creates a revenue flow for the country.
- Using blockchain to track and collect the tax levy facilitates compliance with the tax regime, permits third parties to more easily audit the tax program, which should improve accountability, and provides transparency to the public that the funds are being transmitted directly to the tax authority and not spent by the businesses that would otherwise collect the levies.
- By committing to reinvest the levies in the local communities, governments may help improve the quality of life for local people and increase the value and preservation of the country's natural resources.
- Reliable process ensuring enhanced trust, transparency and accountability (eliminating fraud and corruption) and a strong tax administration, in light of achieving the UN SDGs
- Achievement of strategic tourism goals



The estimated impact of an eco-tourism tax

In this era of globalization, the tourist sector is becoming more important to many countries.⁴ The travel and tourism industry is one of the world's largest industries. In 2016, it made a global economic contribution (direct, indirect and induced) of over \$7.6 trillion US dollars.⁵ The direct economic value of the industry, including accommodation, transportation, entertainment and attractions, was approximately \$2.3 trillion US dollars that year.⁶ However, global tourism also brings a number of negative side effects – pollution and noise, water shortage and social insecurity, including the safety of tourists. Public Sectors in developing countries face budget constraints when dealing with and mitigating the risk of these effects. Strengthening and maintaining a proper infrastructure for tourism is a key challenge.

The picture below depicts key steps within the value chain of the blockchain-based sustainable tax infrastructure for sustaining eco-tourism in a country.



A tourist books his travel plans; it could be a flight/hotel/train/cruise, etc. Part of the booking process is an eco-tourism levy, which will be paid by any tourist purchasing travel. Alternatively, this could be a tourist tax upon arrival at the airport, a departure levy or even a voluntary contribution. The key point is that the levy or voluntary contribution is labeled via smart contracts to an address on the blockchain and allocated directly to an eco-tourism initiative. To monitor the results and see updates, the tourists can visit a designated government website. Moreover, the tourists can have access to an application that they can use to fund specific projects. Via the app, they can allocate their contribution to a project from a list, or they can submit photos of infrastructure that, in their opinion, needs attention. The app can track the specific time and location at which the picture was taken so that the government can analyze where the most interest for creating a new project exists. Once a project allocation or request is submitted, the user sees a thank-you message and receives an email to confirm their allocation or donation. Upon completion of the project, the user will receive a note with the results of the project, which they can share on social media.

The Public Sector can have a website where various projects are analyzed based upon the number of tourists and amount of funding allocated, geographic region, category of improvement and other factors. Advanced analytics and artificial intelligence can be applied to group and prioritize projects. A variety of contractors and project auditors will be stakeholders in the system. The contractor bid and the auditor's score for the quality of each project can be tracked on the blockchain, and this can generate a reputation score for each contractor. All aspects of funding, bidding and auditor selection can be disclosed via a log which — because it resides on the blockchain — cannot be changed or manipulated.

Along with key outcomes such as (1) sustained eco-tourism infrastructure, and (2) a reliable process ensuring enhanced transparency and accountability, the solution may improve the reputation of the country (or city). The government can demonstrate that the money raised is used to develop the local economy or improve the natural habitat. This should attract more tourists and therefore more future revenues.

How to achieve a sustainable tax infrastructure?

Building a tax infrastructure for sustaining tourism requires a holistic and strategic approach, consisting of six pillars: strategy, legislative framework, operational framework, technological infrastructure, change management and performance measurement.

With respect to the strategy, sustaining eco-tourism starts with a long-term vision, mission and strategy linked to the UN SDGs. This includes the objectives for sustaining eco-tourism, the key principles (voluntary contribution or via a levy), key performance indicators and the means to achieve those targets.

Legislative framework

Regarding the legislative framework, the first question will be the design of a proper legislative framework to introduce the eco-tourism tax in a country or city. Second, given involvement of the blockchain technology, it is important that the legal framework address operational implications. The tax administration responsible for overseeing the introduction and maintenance of the eco-tourist tax must have the capability to do so.

Last but not least, the system should continuously monitor the progress and effectively communicate the results to the constituents, including tourists themselves. This can be achieved in a form of periodic progress reports freely available via applications and/or government websites.



Example of the Tourism Strategic plan

"By 2025, it is hoped that Sri Lanka will be identified as a place for memorable, authentic and diverse tourism experiences."

Source: [Sri Lanka Tourism Strategic Plan, 2017-2020](#)

The role of blockchain/smart contracts in enabling an eco-tourism tax

The key feature of applying blockchain technology in this case is the use of smart contracts. The eco-tourism tax payment or voluntary contribution may be automatically labelled via smart contracts and allocated to the government's special wallet for tourism. This achieves transparent reporting and traceability of taxes/contributions collected, proving how the money is spent.

The blockchain consortium needs to be defined. The consortium should include all relevant stakeholders operating in the eco-tourism value chain. If a tourist is required to pay a tourism levy upon arrival at the airport, the consortium might consist of the tax administration, the immigration office, the ministry of tourism, the financial institution/bank, information technology service providers and others.

The consortium will draft the smart contract up front. The smart contract describes the mutual obligations of the stakeholders. As soon as the counterpart meets the requirements marked in the smart contract, the contract will automatically execute itself. The same will apply if a tax is levied on staying in hotels or guesthouses. Then the hotel or guesthouse is added to the community and reflected in the smart contract.

How the proposed smart contract works: The visitor selects a project to be funded. The government accepts the allocation and this information is written into a smart contract. The work order goes out when enough funds for the project are received and the work begins. Once the project is done, the visitor will be notified of the status of finished project via the app or online.

Why are smart contracts so important?

- **Autonomy**
The tourist is the one making the agreement. There is no need to rely on a broker, lawyer or other intermediaries. Incidentally, this also reduces the danger of mistake or manipulation by a third party, since execution is managed automatically by the network.
- **Trust**
Information is stored on a shared ledger. There's no way that someone can say they lost it.
- **Backup**
On the blockchain, each and every one of the computers (nodes) has the information. Documents are duplicated many times over.
- **Safety**
Cryptography keeps documents safe.
- **Speed**
Ordinarily the process would take time and paperwork to manually process documents. Smart contracts use software code to automate tasks, thereby shaving hours off a range of business processes.

- **Savings**
Smart contracts save time and money for tourists by reducing the need for an intermediary. The tourist would, for instance, have to send paperwork to various offices and have to pay various intermediaries.
- **Secure funds**
The funds will only be transferred to the previously designated recipient, eliminating corruption or mismanagement of funds.

Blockchain can enable (local) Public Sectors to create a transparent, trustworthy and credible tax infrastructure. This in turn will tackle corruption and bureaucracy. In the blockchain, all the payments and transactions are digital with the following benefits:

- The eco-tourism levy can be easily traced,
- The allocation of money can happen automatically via the smart contracts, and
- Expenditures on eco-tourism initiatives can be transparent.



The potential of the eco-tourism sector is enormous. In the case of Sri Lanka, around 2 million tourists visited the country in 2016. If Sri Lanka implemented a tourism levy equal to \$5 per tourist, the government could raise tax revenue of \$10 million annually. This budget could be spent on maintaining and cleaning national parks and oceans, building infrastructure, preserving local historic heritages, supporting local businesses and educating local people. Creating a tax infrastructure for ecotourism can thereby contribute to the economic growth of the country as a whole.

Eelco van der Enden
*PWC*⁷

The sustainable eco-tax business case for enabling a Public Sector to achieve the UN SDGs is scalable and repeatable. The Public Sector interested in creating a sustainable income stream to be used for eco-tourism initiatives in the country may wish to consider this model.

03.

The benefits of blockchain adoption for tax compliance



After reviewing these two use cases of the blockchain application for tax compliance, we see there may be several significant benefits that the technology can bring to Public Sector and tax authorities:

1. Greater integrity and transparency –

fighting fraud and corruption through transparency across all stakeholders, which reduces the asymmetry of information among the parties.

2. Reduced cost of compliance:

The rules of compliance can be written in the blockchain protocol through smart contracts, which leads to automatic self-execution of relevant transactions consistent with these rules, which may reduce levels of noncompliance with tax filings and payments and thereby reduce the need for audits.

3. Improved tax collections

because smart contracts self-execute payments to tax authorities when due. Blockchain may increase tax collections (e.g., VAT or tourism levies). All payments and transactions would be traceable.

4. Incentivize tax compliance:

By leveraging blockchain to improve transparency, the Public Sector would stimulate tax compliance and promote economic growth possibilities, especially for small businesses that are impacted by the compliance costs.

04.

Conclusion





We are just at the beginning of a journey on the road toward blockchain enabled solutions for tax, and we believe there is much potential here. Some of the “out of the box solutions” were developed to create a new infrastructure for the global tax environment. Imagine what will be happening over the next few years as blockchain technology is used for solutions deemed technologically impossible in the past.

However, we must be realistic and manage expectations. Legislation should keep pace with technological developments and organizations should be prepared to change. In our efforts to fight tax fraud, meet the United Nations Sustainable Development Goals and introduce low-cost tax compliance solutions for taxpayers and tax administration agencies, we all have a responsibility to society to make it work. We only hope tax administrations will keep an open mind regarding joining us on the journey toward blockchain enabled solutions for tax.

Appendix

The blockchain ecosystem

Blockchain is not a one-size-fits-all solution. Different enterprises require different ledgers for different purposes.

As a response to different needs, a variety of blockchain designs exists today and new designs are emerging regularly. The design of your application requires analysis and consultation with trusted technical advisors.⁸

Confidential consortium blockchain framework

As enterprises look to apply blockchain technology to meet their business needs, they've come to realize that many existing blockchain protocols fail to meet key enterprise requirements such as performance, confidentiality, governance and required processing power. In order to help address these issues, Microsoft introduced the Confidential Consortium Blockchain Framework, an open-source system that enables high-scale, confidential blockchain networks that meet key enterprise requirements — providing a means to accelerate production and enterprise adoption of blockchain technology.



Microsoft's Confidential Consortium Blockchain Framework represents a breakthrough in achieving highly scalable, confidential, permissioned Ethereum or other blockchain networks that will be an important construct in the emerging world of variously interconnected blockchain systems.

Joseph Lubin
Founder of ConsenSys

The Confidential Consortium Blockchain Framework is designed specifically for confidential consortiums, where nodes and actors are explicitly declared and controlled. Based on these requirements, the framework presents an alternative approach to distributed ledger deployments, giving enterprises greater scalability, distributed governance and enhanced confidentiality, while working to maintain the inherent security and immutability blockchain users expect.

Azure blockchain workbench

The implementation of the blockchain application is only a small fraction of the technical work. Things like the formation and configuration of the consortium, integration with the identity providers, interoperation with external business applications messages and events, integration with off-chain data repositories, user screen building, and reporting are some of the tasks to be accomplished in order to have a production-ready blockchain system.

Microsoft acknowledges the challenges that businesses have in the adoption of blockchain solutions and offers Azure Blockchain Workbench. Azure Blockchain Workbench is a collection of Azure services and capabilities designed to help enterprises create and deploy a new class of applications for sharing business processes and data with multiple, semi-trusted organizations. Currently customers can deploy these services into their subscriptions and integrate them with blockchains available on the Azure Marketplace.

With Azure Blockchain Workbench, the heavy lifting is generally done for them, so enterprises can focus less on scaffolding and more on logic and smart contracts.

Azure Blockchain Workbench simplifies blockchain application development by providing a solution using several Azure components. Azure Blockchain Workbench can be deployed using a solution template in the Azure Marketplace. The template allows users to pick the modules and components to deploy with Azure Blockchain Workbench, such as blockchain stack, type of client application and support for IoT integration. Once deployed, Azure Blockchain Workbench provides access to a web app, iOS app and Android app.

Using Azure Blockchain Workbench, a consortium can federate their Enterprise identities using Azure Active Directory (Azure AD). Workbench generates new user accounts for on-chain identities with the enterprise identities stored in Azure AD. The identity mapping facilitates authenticated login to client APIs and applications and uses the authentication policies of organizations. Workbench also provides the ability to associate enterprise identities to specific roles within a given smart contract. In addition, Azure Blockchain Workbench also provides a mechanism to identify the actions those roles can take and at what time.

After Azure Blockchain Workbench is deployed, users interact with Azure Blockchain Workbench via the client applications, REST-based client API or Messaging API. In all cases, interactions must be authenticated, either via Azure Active Directory (Azure AD) or device-specific credentials.

Users federate their identities to a consortium Azure AD by sending an email invitation to participants at their email address. When logging in, these users are authenticated using the name, password and policies and two-factor authentication of their organization.

Azure AD is used to manage all users who have access to Azure Blockchain Workbench. Each device connecting to a smart contract is also associated with Azure AD.

Azure AD is also used to assign users to a special administrator group. Users associated with the administrator group gain administrator rights/actions within Azure Blockchain Workbench, such as deploying contracts and giving permissions to a user to access a contract. Users outside this group do not have access to administrator actions.

Azure Blockchain Workbench provides automatically generated client applications for web and mobile (iOS, Android), which may be used to validate, test and view blockchain applications.

The application interface is dynamically generated based on smart contract metadata and can accommodate many use cases. The client applications deliver a user-facing front end to the complete blockchain applications generated by Azure Blockchain Workbench. Client applications authenticate users via Azure Active Directory (Azure AD) and then present a user experience tailored to the business context of the smart contract. The user experience enables the creation of new smart contract instances by authorized individuals and then presents the ability to execute certain types of transactions at appropriate points in the business process that the smart contract represents.

Azure Blockchain Workbench includes a REST-based gateway service API. When writing to a blockchain, the API generates and delivers messages to an event broker. When data is requested by the API, queries are sent to the off-chain SQL database. The SQL database contains a replica of on-chain data and metadata that provides context and configuration information for supported smart contracts. Queries return the required data from the off-chain replica in a format informed by the metadata for the contract.

The Azure SQL database attached to Azure Blockchain Workbench stores contract definitions, configuration metadata and an SQL-accessible replica of data stored in the blockchain. This data can easily be queried, visualized or analyzed by directly accessing the database.

Developers and other users can use the database for reporting, analytics or other data-centric integrations. For example, users can visualize transaction data using Power BI.

This off-chain storage provides the ability for enterprise organizations to query data in SQL rather than in a blockchain ledger. Also, by standardizing on a standard schema that's agnostic of blockchain technology stacks, the off-chain storage enables the reuse of reports and other artifacts across projects, scenarios and organizations.

About the authors



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Kuralay is a core team member of PwC's Tax Strategy & Operations practice. She is focused on design and implementation of sustainable tax compliance strategies for governments, tax administrations, intra-governmental organizations, businesses and other organizations. This also includes support on digital transformation agenda, innovative audit strategies, co-operative compliance modelling, capacity building and performance measurement. Prior to joining PwC, Kuralay specialized in international aspects of corporate taxation of MNEs and conducted several research-works in the field of tax policy. She holds an LL.M. Degree in International Tax Law from Vienna University of Economics and Business.



Eelco van der Enden

Eelco leads PwC's Tax Strategy & Operations practice and has nearly 30 years of experience. Before joining PwC in 2007, he worked for various multinationals as head of tax, treasury, risk management and corporate finance. He supports businesses, governments, tax administrations, intra-governmental organizations and NGOs in their endeavors to design and implement sustainable tax compliance strategies. As part of this process, he advises on and implements solid foundations for ameliorating tax compliance infrastructures by building performance measurement systems and innovative audit strategies. He is a lecturer at various European universities, and Chairman of the Tax Policy Group of Accountancy Europe. Eelco has published more than 40 articles on tax governance and is chief editor of Tax Assurance Magazine.



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Valentina is the Director of Government Industry Solutions at Microsoft, in charge of driving customer digital transformation based on a deep understanding of their industry, its drivers and the critical solutions. She is also responsible for the development of the government industry solutions and business development model, including establishing strategic partnerships with ICT, advisory, academia and international organizations such as OECD and IOTA. Valentina has more than 17 years' experience in ICT, business development and sales and marketing, with an education in business & ITC, finances & marketing, graduating from the National Economics Academy in Romania, Université de Sciences Sociales Toulouse and Université d'Orléans, France.



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Fieke is a director in PwC's Tax Strategy and Operations practice. As a chartered public accountant with a degree in tax law, she supports both businesses and tax administrations in designing and implementing sustainable, technology enabled, tax compliance strategies. Before joining PwC she has been working for the Netherlands Tax and Customs Administration as a key account manager, being responsible for the supervision on fourteen of the largest (industrial) companies established in the Netherlands. She has developed several international best practices in the field of co-operative compliance programming, risk-based auditing, tax performance measurement and digital transformation processes of tax administrations. Besides, she has extensive knowledge and experience in strengthening the level of internal control over tax by designing and implementing Tax Control Frameworks for large organizations. Fieke lectures at Nyenrode Business University, the Dutch Order of Tax Advisors and IBFD.

About PwC

At PwC, our purpose is to build trust in society and solve important problems. It is this focus which informs the services we provide and the decisions we make. Demonstrating genuine leadership is more important to us than size or short-term revenue growth. To achieve our aim to be recognized as “the leading professional services firm,” we must be innovative, responsible and attract outstanding people. Our strategy is therefore built around five priorities: 1. be technology enabled; 2. deliver exceptional value to our clients; 3. empower our people; 4. lead by example; 5. invest in sustainable growth. Attracting the right talent continues to be paramount, and as a progressive employer, we will continue to develop a diverse and agile workforce.

About Vertex

Vertex is the leading provider of corporate tax software and services for companies of all sizes. Our cloud and on-premise solutions enable compliance for every major line of tax, including sales and use, income, value-added, and payroll. Our solutions continually raise the bar on how to simplify tax calculations and reporting while complying with ever-changing tax rates and rules.

About Microsoft

Microsoft is the leading platform and productivity company for the mobile-first, cloud-first world, and its mission is to empower every person and every organization on the planet to achieve more. Our vision is to help government organizations do more to promote citizen well-being, influence positive societal change, and enhance the services they deliver.

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Vertex

www.vertexinc.com

Microsoft

www.microsoft.com/government

Sources

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- 1 https://ec.europa.eu/taxation_customs/business/tax-cooperation-control/vat-gap_en
- 1 <https://www.irs.gov/newsroom/the-tax-gap>
- 2 https://ec.europa.eu/taxation_customs/sites/taxation/files/2018_vat_gap_report_en.pdf
- 3 <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>
- 4 In 2016, the United Nations agreed on the Sustainable Development Goals (UN SDGs) as a next step to the Millennium Development Goals. The 17 UN SDGs are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity. The UN SDGs call for a partnership to make the right choices to improve life in a sustainable way, to provide clear guidelines and targets for countries to adopt. Achieving the UN SDGs is of great importance to current and future generations.

There are several UN SDGs linked to tax. Specifically, UN SDGs 17 and 16. UN SDG 17.1 focuses on strengthening domestic resource mobilization. It tries to achieve this through improving domestic capacity for tax and other revenue collection and international support to developing countries.

The UN SDG target 16 is dedicated to the promotion of peaceful and inclusive societies for sustainable development, the provision of access to justice for all, and building effective, accountable institutions. Building strong institutions is necessary to foster investor confidence and strengthen public finances. Safeguarding financial stability and promoting social inclusion are important for sustainable growth and stability. As taxes are a major source of income, Public Sectors need a sustainable tax base and robust tax infrastructure to achieve UN SDG 16 & 17 objectives. The United Nations is encouraging Public Sectors to integrate the UN SDGs into their national development plans and policies, as economic stability is a prerequisite to reduce governmental dependency on financial support from development banks, donor countries or businesses.

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