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## UNIQUE BENCHMARKING TOOL TO MEASURE RELATIVE CARDHOLDER CARBON FOOTPRINT COMPARED TO IN-MARKET AND GLOBAL PEERS

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**“UNIQUE BENCHMARKING TOOL TO MEASURE  
RELATIVE CARDHOLDER CARBON FOOTPRINT  
COMPARED TO IN-MARKET AND GLOBAL PEERS”**

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## **TECHNICAL FIELD**

[0001] The present subject matter is, in general, related to sustainability spend index, and particularly to a method for calculating Carbon (CO<sub>2</sub>) emission scores from purchases of customers and creating a score-based numerical representation to represent the carbon footprint.

## **BACKGROUND**

[0002] A majority of products and services that customers buy contribute to environmental pollution. Carbon footprint estimation is one of the known methods to quantify such influences. As users become more environmentally concerned, there is a greater need for financial products that provide carbon footprint solutions. People are becoming increasingly conscious of how their activities (for example, monthly shopping) affect the environment, and the need for carbon analytic tools is significant in the corporate world.

[0003] Users may determine their total carbon footprint, including direct and indirect Green House Gas (GHG) emissions by analyzing their lifestyle and living situations. However, without precise information on the effects of human activity and consumption on the environment, it is challenging to calculate the carbon footprint of any particular product or service. Also, the users may find it challenging to comprehend the generated carbon footprint score. The understandability and perception of the carbon footprint scores in the market remain largely low, given that carbon emission i.e., CO<sub>2</sub>/kg currency is still relatively new. Therefore, there is a need for quantitative, data-driven approaches to quantify greenhouse gas emissions and create actionable strategies to reduce them.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

[0004] The accompanying drawings, which are incorporated in and constitute a part of this disclosure, illustrate exemplary embodiments and, together with the description, explain the disclosed principles. In the figures, the left-most digit(s) of a reference number identifies the figure in which the reference number first appears. The same numbers are used throughout the figures to reference like features and components. Some embodiments of device or system and/or methods in accordance with embodiments of the present subject matter are now described, by way of example only, and with reference to the accompanying figures, in which:

[0005] **Fig. 1** illustrates an exemplary architecture that implements embodiments consistent with the present disclosure.

[0006] **Fig. 2** shows a flowchart illustrating a method for measuring the carbon footprint of purchases according to embodiments consistent with the present disclosure.

[0007] **Fig. 3** shows an estimation of global financial transactions in accordance with some embodiments consistent with the present disclosure.

[0008] **Fig. 4** shows an exemplary approximation of contributions of individual MCCs with respect to carbon emission, in accordance with some embodiments consistent with the present disclosure.

[0009] **Fig. 5** shows an exemplary visualization of carbon emission for different purchasing categories in accordance with some embodiments consistent with the present disclosure.

[0010] **Fig. 6** shows a flowchart illustrating a method for designing a sustainable banking proposition in accordance with some embodiments consistent with the present disclosure.

[0011] **Fig. 7** shows an exemplary visual representation of a user's carbon footprint/green score based on estimated carbon emission in accordance with some embodiments consistent with the present disclosure.

[0012] **Fig. 8** shows an exemplary visual representation of a user's carbon footprint/green score based on transactions in accordance with some embodiments consistent with the present disclosure.

[0013] **Fig. 9** shows an exemplary visual representation of a user's carbon footprint and green score benchmarks in accordance with some embodiments consistent with the present disclosure.

[0014] **Fig. 10a** illustrates exemplary monthly account-level emissions in accordance with some embodiments consistent with the present disclosure.

[0015] **Fig. 10b** illustrates monthly carbon emissions with respect to merchant category in accordance with some embodiments consistent with the present disclosure.

[0016] **Fig. 11a, 11b, and 11c** shows exemplary illustration of sustainability spend score along with the cardholder's green score benchmark based on user's carbon footprint in accordance with some embodiments consistent with the present disclosure.

[0017] **Fig. 12** shows an exemplary view of user's carbon footprint breakdown by category spend in accordance with some embodiments consistent with the present disclosure.

[0018] The figures depict embodiments of the disclosure for purposes of illustration only. One skilled in the art will readily recognize from the following description that alternative embodiments of the structures and methods illustrated herein may be employed without departing from the principles of the disclosure described herein.

### **DESCRIPTION OF THE DISCLOSURE**

[0019] It is to be understood that the present disclosure may assume various alternative variations and step sequences, except where expressly specified to the contrary. It is also to be understood that the specific devices and processes illustrated in the attached drawings and described in the following specification are simply exemplary and non-limiting embodiments or aspects. Hence, specific dimensions and other physical characteristics related to the embodiments or aspects disclosed herein are not to be considered as limiting.

[0020] In the present document, the word "exemplary" is used herein to mean "serving as an example, instance, or illustration." Any embodiment or implementation of the present subject matter described herein as "exemplary" is not necessarily to be construed as preferred or advantageous over other embodiments.

[0021] While the disclosure is susceptible to various modifications and alternative forms, specific embodiment thereof has been shown by way of example in the drawings and will be described in detail below. It should be understood, however that it is not intended to limit the disclosure to the particular forms disclosed, but on the contrary, the disclosure is to cover all modifications, equivalents, and alternative falling within the spirit and the scope of the disclosure.

[0022] The terms "comprises", "comprising", or any other variations thereof, are intended to cover a non-exclusive inclusion, such that a setup, device or method that comprises a list of components or steps does not include only those components or steps but may include other

components or steps not expressly listed or inherent to such setup or device or method. In other words, one or more elements in a device or system or apparatus preceded by “comprises... a” does not, without more constraints, preclude the existence of other elements or additional elements in the device or system or apparatus.

[0023] The terms "an embodiment", "embodiment", "embodiments", "the embodiment", "the embodiments", "one or more embodiments", "some embodiments", and "one embodiment" mean "one or more (but not all) embodiments of the invention(s)" unless expressly specified otherwise.

[0024] The terms "including", "comprising", “having” and variations thereof mean "including but not limited to" unless expressly specified otherwise.

[0025] **Fig. 1** illustrates an exemplary architecture that implements embodiments consistent with the present disclosure.

[0026] In an embodiment, most items and services purchased by users have an environmental impact. Transparent financial solutions that clearly communicate how users may contribute to environmental sustainability are in high demand. Also, the users are interested in understanding how the way they spend their money impacts on the environment in terms of their carbon footprint. Hence, user’s transactional data may be considered to analyze the amount of Carbon dioxide (CO<sub>2</sub>) emissions related to the items or services being purchased by the users and then calculate an approximate CO<sub>2</sub> emission value associated with every purchase. Thereafter, the general carbon emissions intensity per purchase may be estimated by combining it with external sources of carbon emissions of various industries and goods. Further, a numerical scale representation of the carbon footprint score is created along with the carbon footprint benchmark that rates customers based on their spending. The carbon footprint benchmarking allows the user’s/cardholder to understand their greenhouse gas emissions with respect to previous years and their peers. As a result, the carbon footprint benchmarking proposed by the present disclosure helps individual users and companies/businesses in understanding the impact of their transactions on the environment.

[0027] In an embodiment, the exemplary architecture 100 shown in Fig. 1 includes one or more components for creating a score-based numerical representation to represent the carbon footprint. In an embodiment, external information on sectoral emissions (obtained from an

external database) may be combined with VisaNet data to generate an approximation of the CO<sub>2</sub> emission per US\$ at the Merchant Category Code (MCC) level. The VisaNet data indicates the proportion of consumption by industry at the MCC level. The MCC is a four-digit number assigned to describe a merchant's primary business based on annual sales volume measured in local currency. The MCC may be used to identify a specific merchant or type of transaction. In an embodiment, payment brands use the MCC to classify merchants and businesses by the type of goods or services provided in order to track and restrict transactions.

[0028] In an embodiment, the system 105 receives information from the user 101 and the MCC carbon intensity 103 to calculate the net CO<sub>2</sub> (kg) emitted for the goods or services that is being purchased by the user 101. The user information comprises financial transaction data along with a detailed account of the user's expenditures. Finally, a numerical scale score 109 may be created to provide a numerical representation of the user's/cardholder's green score based on the carbon emission.

[0029] **Fig. 2** shows a flow diagram illustrating a method for measuring the carbon footprint of purchases according to embodiments consistent with the present disclosure.

[0030] In an embodiment, as shown in **block 201**, initially, the method comprises mapping the MCCs to item-level purchase information from a Classification of Individual Consumption by Purpose (COICOP) category to obtain corresponding CO<sub>2</sub> intensity multipliers. The COICOP is a classification developed by the United Nations Statistics Division to classify and analyze individual consumption expenditures incurred by households, non-profit institutions serving households and general government according to their purpose (**Fig. 3** shows exemplary estimations of expenditures). The COICOP includes categories such as clothing and footwear, housing, water, electricity, gas, and other fuels. The external database uses the COICOP standard to tag industry sectors and line items related to household consumption and approximates their CO<sub>2</sub> emissions. The financial sector, by contrast, uses approximately 1000 standard MCCs to tag merchants and transactions to industry sectors. The two standards are reconciled by mapping each MCC to the relevant COICOP categories based on the nature of the line items for each MCC.

[0031] Further, as indicated in **block 203**, after mapping the COICOP categories to the MCCs, a share of spending by industry sector is computed to get an approximation of individual MCC contributions to national CO<sub>2</sub> emissions. **Fig. 4** illustrates how the carbon emission calculating

process is broken down across different MCCs. All COICOP categories are associated with a Greenhouse Gas (GHG) intensity as well to specify the average amount of GHG emissions per monetary unit. Using illustrative data, the total monthly expenditure in each country is driven by one or more categories. The one or more categories include, without limiting to, veterinary services, restaurants, hotels, clothing garments, footwear, food, grocery, fuel, plumbing, house maintenance, central heating repair and the like. Further, the carbon intensity per dollar spent is calculated by combining the percentage share of spend ( $A_i$ ) with the normalized CO<sub>2</sub> intensity per dollar spent, as derived from the COICOP-MCC multipliers ( $w_i$ ).

[0032] Further, as shown in **block 205**, the method comprises measuring the individual MCC contributions to CO<sub>2</sub> emission per 1 US\$ GDP to estimate country conversion factors. The calculation assumes that expenditure from Visa products equates to an average value of CO<sub>2</sub> per 1 US\$ GDP spent, provided by the Emissions Database for Global Atmospheric Research (EDGAR) database. If the average CO<sub>2</sub> emission per 1 US\$ GDP spent in each country is C kg per 1 US\$ GDP, a conversion factor i.e., “country factor” may be identified to determine the ratio between emission intensity and share of spend. For example, the weighted sum of individual MCC contributions averages to the EDGAR C kg per 1 US\$ GDP spent on cards for any Country X, wherein “X” refers to a country conversion factor as shown in equation 1 below.

$$\sum_{i=mcc\ 1}^{mcc\ 1000+} A_i * w_i * country = C \quad \dots (1)$$

where  $A_i$  indicates percentage share of spend for MCC category “i” and  $w_i$  indicates carbon intensity weight for category “i”.

[0033] In an embodiment, after finding out the constant value by filling in the carbon intensity ( $w_i$ ) from COICOP and share of spend ( $A_i$ ) from VisaNet, the carbon intensity per MCC as Kg per 1 US\$ may be calculated. For example, purchasing goods in Jamaica may have a different average carbon intensity (C) than the UK due to differences in energy production methods and the share of imported goods. As more granular data becomes available in more countries, the method eliminates the country conversion factor from the Visa sustainability index calculation. The current frequency of refresh for the calculation is annual, depending on how regularly



external databases are updated. Further, industry emissions are typically classified into Scope 1, Scope 2 and Scope 3. The greenhouse gas protocol standard classifies emissions as follows:

- a) Scope 1: Direct greenhouse gas emissions originating from company operations such as running boilers and vehicles.
- b) Scope 2: Indirect emissions from buying electricity, cooling buildings and other processes that a third party manages on their behalf.
- c) Scope 3: Refers to all emissions that the company is directly or indirectly responsible for up and down the value chain. For example, buying products from suppliers and emissions of products originating from a company after customers use them. This typically is the biggest block to accurate Environmental, Social, and Governance (ESG) quantification.

[0034] **Fig. 5** shows an exemplary visualization of carbon emission for different purchasing categories in accordance with some embodiments consistent with the present disclosure.

[0035] In an embodiment, suppose a user's monthly purchases are as shown in Fig. 5. That is, the user spends about US\$1,000 per month, and different categories have different carbon intensities. At the end of the month, the user may see a summary and detailed breakdown of CO<sub>2</sub> emissions relating to each purchase category and get insights on how to reduce his or her impact.

[0036] **Fig. 6** shows a flowchart illustrating a method for designing a sustainable banking proposition in accordance with some embodiments consistent with the present disclosure.

[0037] As shown in **block 601**, market research on users may be conducted by developing a thorough understanding of user sustainability needs. Thereafter, potential product features may be tested based on user behaviour, for example, real-time behavioural changes, where the user may prefer only a digital card or prefer any specific features which could form part of the next phase. Further, as shown in **block 603**, the method comprises creating a customizable digital proposition that delivers specific features. Users may have different preferences, for example, for one user a recycled plastic card may be important, while for another user how they choose to offset their carbon footprint could be on top of the list. Also, the users need to be able to choose which is best for usage. Further, as shown in **block 605**, the method comprises developing, iterating, and testing each aspect of the sustainable banking customer journey to make this a "best in class" experience. Further, the user is provided with helpful information

related to sustainability, such as tips on sustainable consumption, or benchmarking on how they are doing compared to others. Further, as shown in **block 607**, the key capabilities required from Visa and sustainable banking solutions are established to deliver the required sustainable banking service blueprint. Thereafter, a critical path implementation roadmap is created for marketing and future enhancements to continually meet users' needs.

[0038] As an illustration, consider a scenario in which user is aware of the sustainability spend index, wherein the sustainability spend index may be created based on the user's transaction data. The visual representation of the numerical scale score is based on knowing user impact (green score), understanding the impact (breakdown), and contextualizing the impact (i.e., benchmarking). In an embodiment, the key themes for creating a sustainability spend index include:

- 1) There is growing awareness of the broader push for sustainability, but an education gap exists.
- 2) "Greener" participants are self-motivated, although existing actions are limited to sustainable materials.
- 3) Users need the right data and insights to be able to action on.
- 4) 'More' is not always better; a balance between simplicity and sufficiency is needed.
- 5) The Fear of Missing Out (FOMO) is strong; information is only useful when compared to others.

[0039] In an embodiment, knowing the user's green score comprises carbon emission (i.e., kg CO<sub>2</sub> e), points (for example, 0 to 100), rating (for example, stars) and trust & education. For example, as shown in **Fig. 7**, the visual representation of the user's carbon footprint score for March 2022 is 8,775 kg CO<sub>2</sub> or 6.9/10 or 4 out of 5, wherein the score is based on estimated carbon emission from actual spend.

[0040] In an embodiment, the user's green score breakdown includes transaction level, MCC level, weekly and/or monthly transactions and translation information (for example, 1 car's daily CO<sub>2</sub> emission) as shown in **Fig. 8**. The green score contextualizing includes factors like 'compared to self' (for example, last month green score), 'compared to peers', and 'compared to geo'. For example, user transaction data are available between three months and five years back in time, depending on the bank. This means, the users may be able to identify how their carbon footprint has changed over time. In an embodiment, as shown in **Fig. 9**, the visual

representation of the user's green score benchmark is 6.9/10 and other cardholders in the same spending band score are 5.2/10. The spend bands are needed to determine emissions within a similar peer set.

[0041] In another embodiment, the users can regularly participate in green score calculations to earn green badges, recognition, access to credits (for example, users may receive lower interest rates for loans), offsetting (for example, carbon offset, donations) and rewards (for example, cashback and offers).

[0042] **Fig. 10a** illustrates an exemplary view of monthly account-level emissions, wherein the sustainability spend score is computed within peers of the same spend band. The total sustainability score for each card is determined based on the various spend bands (for example, 1k-2.5k, ... 8k-10k). **Fig. 10b** shows the sustainability scorecard display of top CO<sub>2</sub> emission drivers. For example, Card "xxx4" spent \$2500 to charge an electric car, which results in an estimated 20kg of MCC CO<sub>2</sub> emission.

[0043] In an embodiment, **Fig. 11a**, **Fig. 11b** and **Fig. 11c** provide a brief glance at the user's carbon footprint emission and a breakdown between the four main categories. The four categories are transportation (for example, emission from public and private transport including air travel), utilities, shopping and others. The cardholder green score benchmark, as shown in **Fig. 11b**, serves as a baseline and/or reference level for determining carbon measures and financial performance of the cardholders with similar spending patterns. As an example, if the user's green score benchmark based on the carbon emissions is 6.9/10, and an average of other cardholders in the same spending pattern is 5.0/10, the score indicates that the carbon footprint resulting from the user's spendings is lower compared to the peer users and/or users in the same spending pattern. Further, as shown in **Fig. 12**, the breakdown section allows users to explore how their carbon emissions from consumption vary over time and the relative size of emission from consumption of transportation, utilities, shopping and others.

[0044] In an embodiment, one or more computer-readable storage media may be utilized in implementing embodiments consistent with the present disclosure. A computer-readable storage medium refers to any type of physical memory on which information or data readable by a processor may be stored. Thus, a computer-readable storage medium may store instructions for execution by one or more processors, including instructions for causing the processor(s) to perform steps or stages consistent with the embodiments described herein. A

non-transitory computer readable medium may include media such as magnetic storage medium, optical storage, volatile and non-volatile memory devices etc. Further, non-transitory computer-readable media may include all computer-readable media except for a transitory. The code implementing the described operations may further be implemented in hardware logic (e.g., an integrated circuit chip, Programmable Gate Array (PGA), Application Specific Integrated Circuit (ASIC), etc.).

[0045] The described operations may be implemented as a method, system or article of manufacture using standard programming and/or engineering techniques to produce software, firmware, hardware, or any combination thereof. The described operations may be implemented as code maintained in a “non-transitory computer readable medium”, where a processor may read and execute the code from the computer readable medium. The processor is at least one of a microprocessor and a processor capable of processing and executing the queries.

[0046] The illustrated steps are set out to explain the exemplary embodiments shown, and it should be anticipated that ongoing technological development will change the manner in which particular functions are performed. These examples are presented herein for purposes of illustration, and not limitation. Further, the boundaries of the functional building blocks have been arbitrarily defined herein for the convenience of the description. Alternative boundaries can be defined so long as the specified functions and relationships thereof are appropriately performed. Alternatives (including equivalents, extensions, variations, deviations, etc., of those described herein) will be apparent to persons skilled in the relevant art(s) based on the teachings contained herein. Such alternatives fall within the scope and spirit of the disclosed embodiments. Also, the words "comprising," "having," "containing," and "including," and other similar forms are intended to be equivalent in meaning and be open ended in that an item or items following any one of these words is not meant to be an exhaustive listing of such item or items or meant to be limited to only the listed item or items. It must also be noted that as used herein, the singular forms “a,” “an,” and “the” include plural references unless the context clearly dictates otherwise.

[0047] Finally, the language used in the specification has been principally selected for readability and instructional purposes, and it may not have been selected to delineate or circumscribe the inventive subject matter. Accordingly, the disclosure of the embodiments of the disclosure is intended to be illustrative, but not limiting, of the scope of the disclosure.

[0048] With respect to the use of substantially any plural and/or singular terms herein, those having skill in the art can translate from the plural to the singular and/or from the singular to the plural as is appropriate to the context and/or application. The various singular/plural permutations may be expressly set forth herein for sake of clarity.

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**ABSTRACT**

The present disclosure relates to a method and system for calculating Carbon (CO<sub>2</sub>) emission scores from customer purchase data and creating a score-based numerical representation to represent the carbon footprint with respect to the cardholder’s green-score benchmark. The present disclosure suggests mapping the MCCs to purchased item-level information to obtain CO<sub>2</sub> intensity multipliers. Thereafter, the net carbon emission value is calculated based on the transaction data associated with the purchased items. Further, a visual representation of the numerical scale score is created to represent the user green score/carbon footprint.

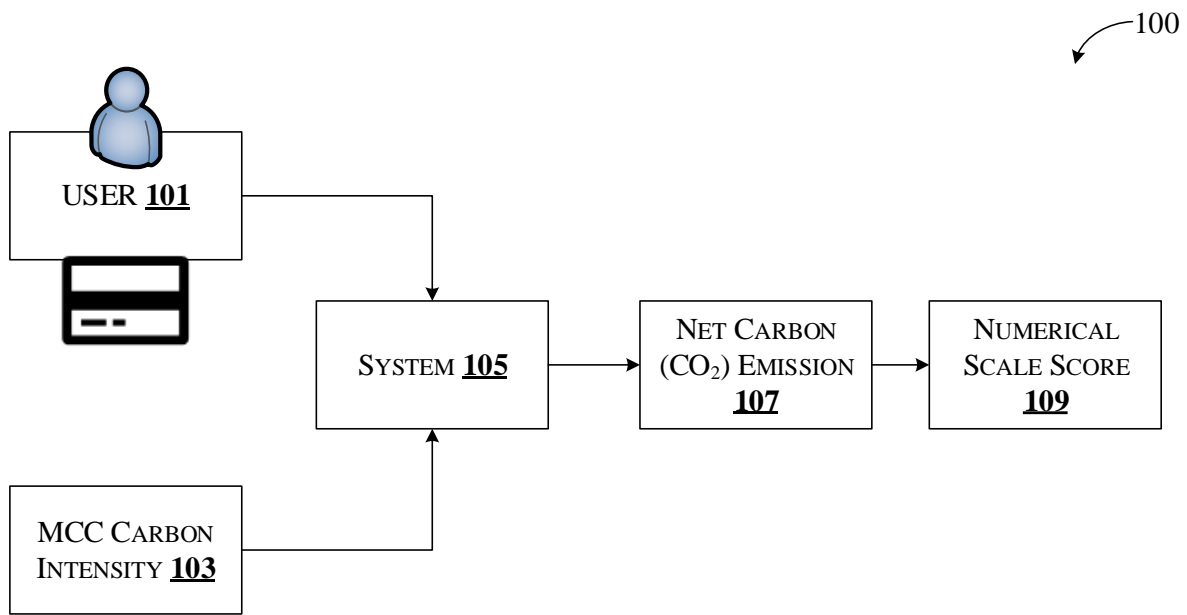


Fig. 1

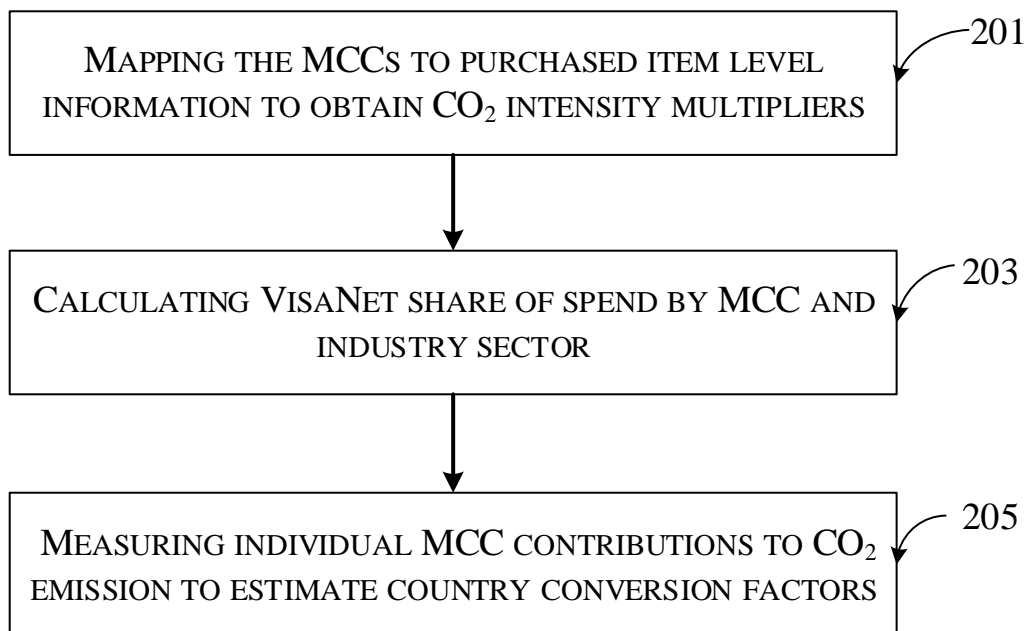


Fig. 2



Fig. 3

MCC Name	Total spend in Singapore (M US\$)	% share of spend (A)	COICOP mapping	COICOP mapping COICOP CO <sub>2</sub> intensity (kg/US\$)	Normalized intensity multiplier (w) Mock data set
Veterinary services	20	12.5%	Veterinary	0.16	0.52x
Hotels	40	25%	Restaurants & hotels	0.15	0.49x
Women's fashion	10	6.25%	Clothing & footwear, garments	0.11	0.36x
Food & grocery	30	18.75%	Food & non-alcoholic beverages	0.11	0.36x
Fuel	40	25%	Gasoline, diesel and other oils	1.2	3.93x
Heating, plumbing, utilities	20	12.5%	Central heating repair, house maintenance	0.1	0.32x

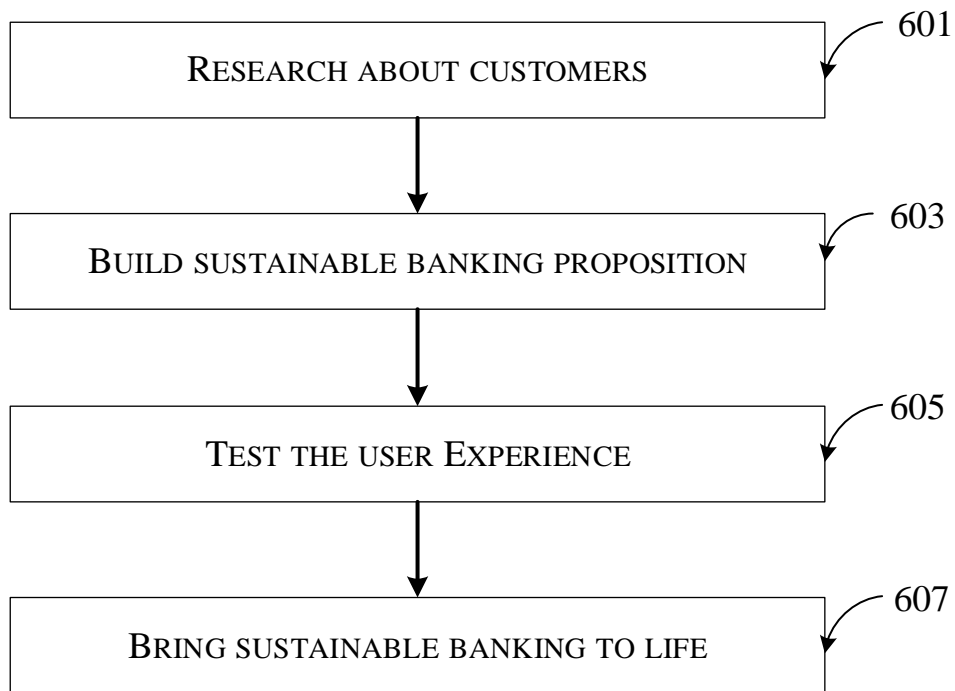
(COICOP/ Avg COICOP 0.305 kg/US\$)

Fig. 4



	Food/Groceries	Retail	Travel	Fuel/Utilities	Entertainment	Services	Government	Total
Monthly spend in category (US\$)	168	106	44	152	80	421	78	1,049
Kg CO <sub>2</sub> emissions per US\$	0.2	0.2	0.3	1.7	0.2	0.2	0.02	
Net Kg CO <sub>2</sub>	34	21	13	258	16	84	2	428

**Fig. 5**

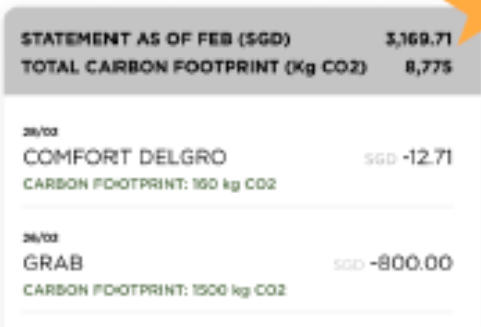


**Fig. 6**



Fig. 7

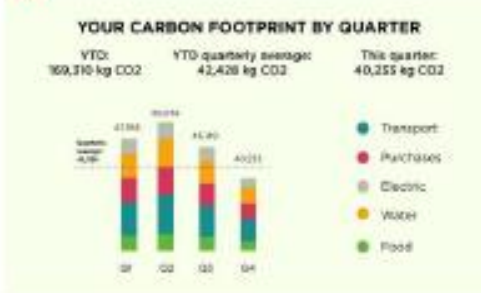
B1



B2



B3



B4



Fig. 8



Fig. 9

<b>Card #</b>	<b>Monthly Spend (\$)</b>	<b>Monthly Spend Band</b>	<b>Purchase Month</b>	<b>Total CO<sub>2</sub> (kg)</b>	<b>Total Sustainability Score (1-10)</b>
XXX1	10,000	8K-10K	06-22	70	7.5
XXX2	5,000	4K-6K	06-22	40	7
XXX3	4,000	4K-6K	06-22	45	5
XXX4	2,000	1K-2.5K	06-22	23	6

**Fig. 10a**

<b>Card #</b>	<b>Merchant Category</b>	<b>Merchant Category Spend (\$)</b>	<b>Purchase Month</b>	<b>MCC CO<sub>2</sub> Emission (kg)</b>
XXX1	Advertising	9000	06-22	10
XXX2	Taxi Cabs	1000	06-22	60
XXX3	Business Svcs	2500	06-22	20
XXX4	Electric Car Charging	2500	06-22	20

**Fig. 10b**

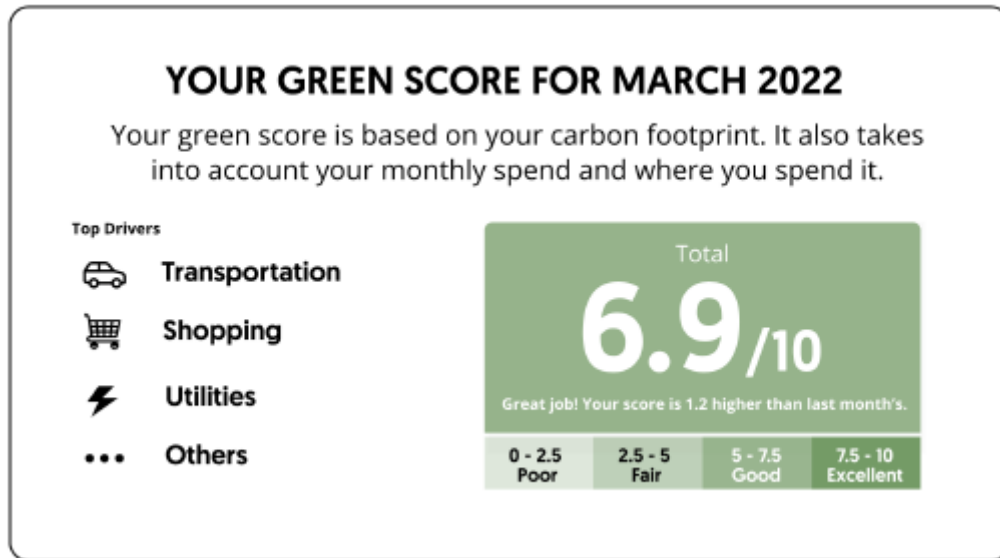


Fig. 11a

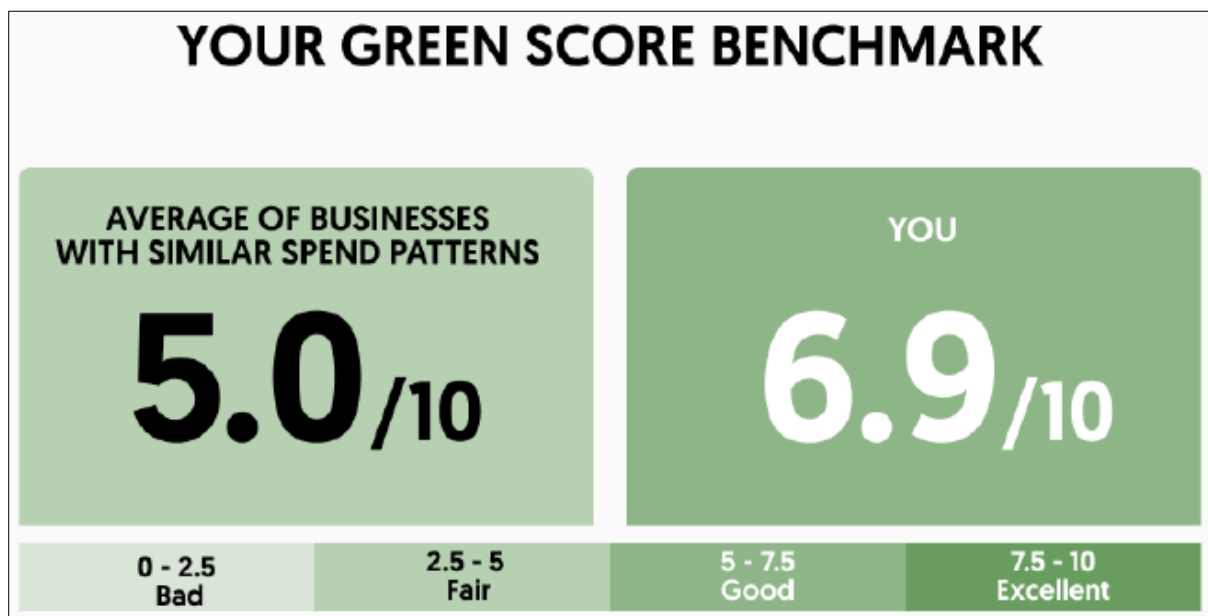


Fig. 11b



Fig. 11c



Fig. 12