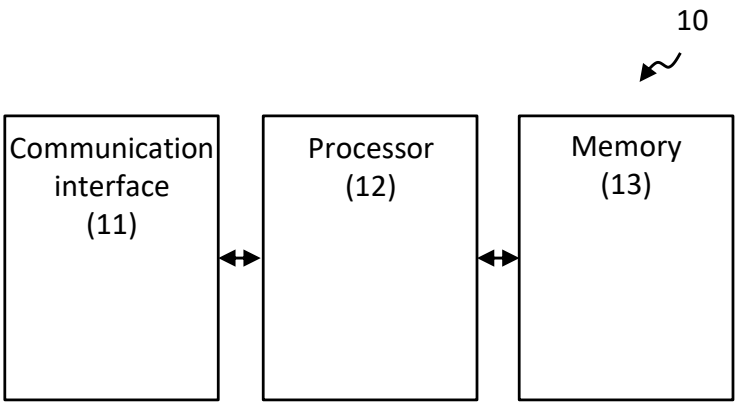

FIG. 1

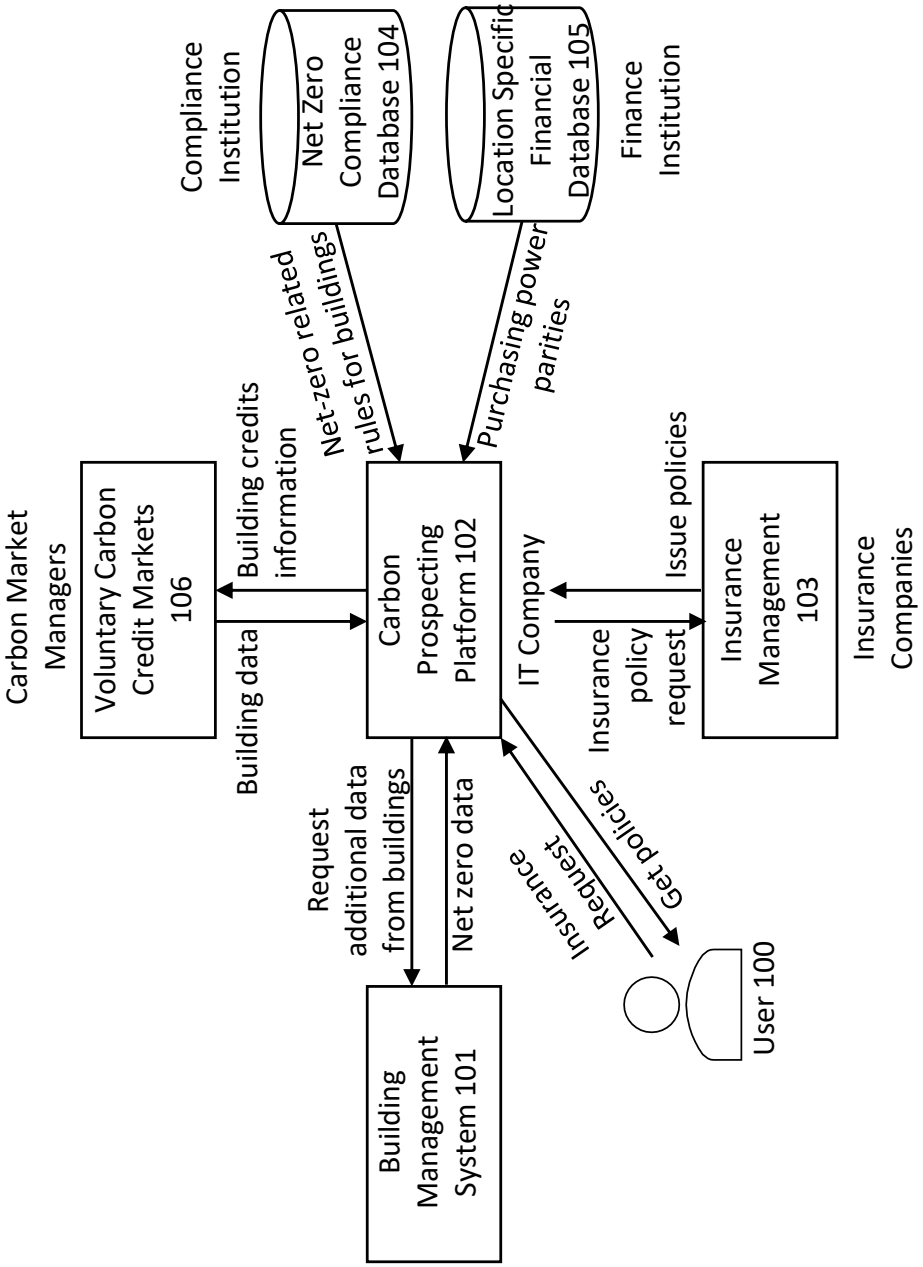
Compliance Institution
Net Zero Compliance Database 104
Location Specific Financial Database 105
Finance Institution
Net-zero related rules for buildings
Purchasing power parities
Carbon Market Managers
Voluntary Carbon Credit Markets 106
Building credits information
Building data
Carbon Prospecting Platform 102
IT Company
Issue policies
Insurance policy request
Insurance Management 103
Insurance Companies
Request additional data from buildings
Net zero data
Insurance Request
Get policies
Building Management System 101
User 100

FIG. 2

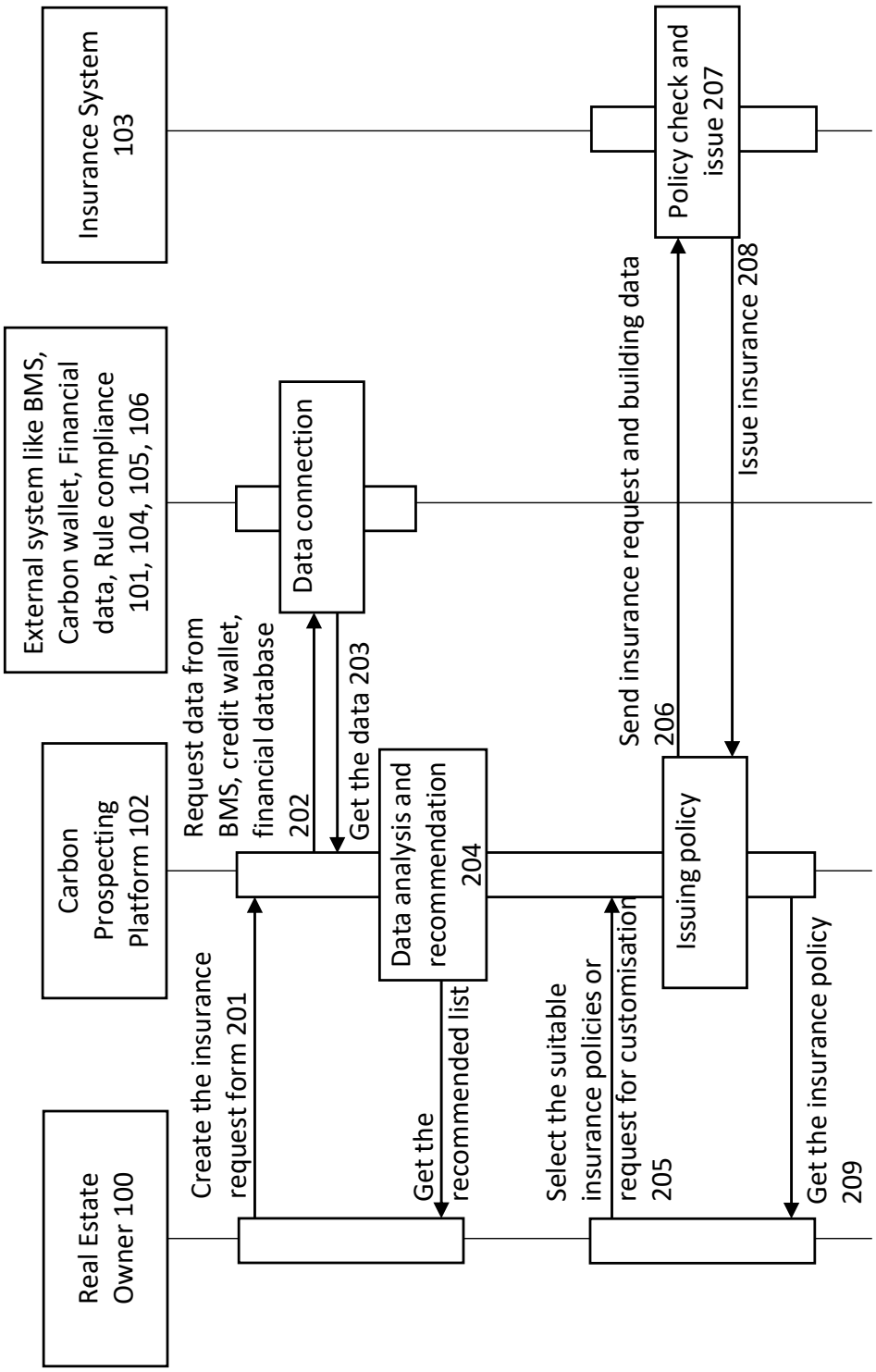
Insurance System 103
External system like BMS, Carbon wallet, Financial data, Rule compliance 101, 104, 105, 106
Carbon Prospecting Platform 102
Real Estate Owner 100
Policy check and issue 207
Data connection
Data analysis and recommendation 204
Issuing policy
Request data from BMS, credit wallet, financial database 202
Get the data 203
Send insurance request and building data 206
Issue insurance 208
Create the insurance request form 201
Get the recommended list
Select the suitable insurance policies or request for customisation 205
Get the insurance policy 209

FIG. 3

1. Basic Information:
•*Name:* Green Building
•*Address:* 123 Green Street, EcoFriendlyCity
•*Contact Details:* Email: green.build@email.com, Phone: (55534) 123-4567
2. Building Details:
•*Building Type:* Commercial Office Space
•*Size:* 50,000 square feet
•*Purpose:* Office and coworking spaces
3. Historical Performance Data: Emission Data, Removal Data, Reduction data
4 Efficiency Measures and Sustainability Initiatives
•*LED Lighting:* Installed throughout the building
•*Energy Star Certified Equipment:* Used for office appliances
•*Renewable Energy Sources:* Solar panels providing 30% of energy needs
•*Recycling Program:* Implemented for paper, plastic, and electronics
•*Employee Education:* Regular seminars on sustainability practices
•Implemented energy-efficient HVAC systems resulting in significant energy savings
5. Compliance Documentation:
•*Environmental Audits:* Annual audits conducted by certified environmental agencies
•*Regulatory Compliance Certificates:* Copies of certificates proving adherence to environmental regulations
6. Future Adaptation Plans:
•*Expansion of Renewable Energy:* Planning to increase solar panel capacity by 20%
•*Employee Training Programs:* Introducing programs to encourage sustainable practices among employees
7. Carbon Credit Dynamics:
•*Current Carbon Credit Balance:* 5,000 credits
•*Strategy:* Engaging in afforestation projects to increase carbon credit balance
8. **Type of Coverage**: Green washing credit loss coverage
Renewable Energy System Coverage
Carbon Emission Liability Coverage

FIG. 4

Net-Zero Insurance Policy Document
Policy Type: Net-Zero Insurance Policy
Policy Number: NZI-123456
Effective Date: 02/03/2023
Expiry Date: 02/04/2025
Insured: Green Building (Policyholder)
Property Insured: 123 Green Street, EcoFriendlyCity
Policy Coverage
Carbon Offsetting Coverage: This policy will cover the cost of carbon credits purchased to offset carbon emissions up to a specified limit, as outlined in the policy terms and conditions.
Carbon Emissions Liability: Any liabilities deriving from potential legal or regulatory actions in relation to the policyholder's carbon emissions will be covered under this policy, subject to the terms and conditions.
Net Zero Performance Guarantee: This insurance will provide financial protection in the event that the property fails to achieve its net-zero carbon goal, as specified in the policy terms and conditions.
Energy Efficiency Retrofit: This policy covers the cost for retrofitting the insured property to improve energy efficiency, subject to the policy terms and conditions, which may include a cap on expenses and certain restrictions regarding the types of improvements that can be made.
Green Building Certification: The policy covers costs associated with achieving recognised green building certifications, including application, compliance, and examination fees, subject to certain terms and conditions.
Premium
The premium for the policy NZI-123456 is set to $4000 per month.
Please refer to the attached Rider(s) and Endorsement(s), if any, for specific terms, limits, conditions, and exclusions that apply to this policy. This is only a summary of your policy. If there is any discrepancy between this document and the actual policy, the terms and conditions of the actual policy will prevail.

FIG. 5A

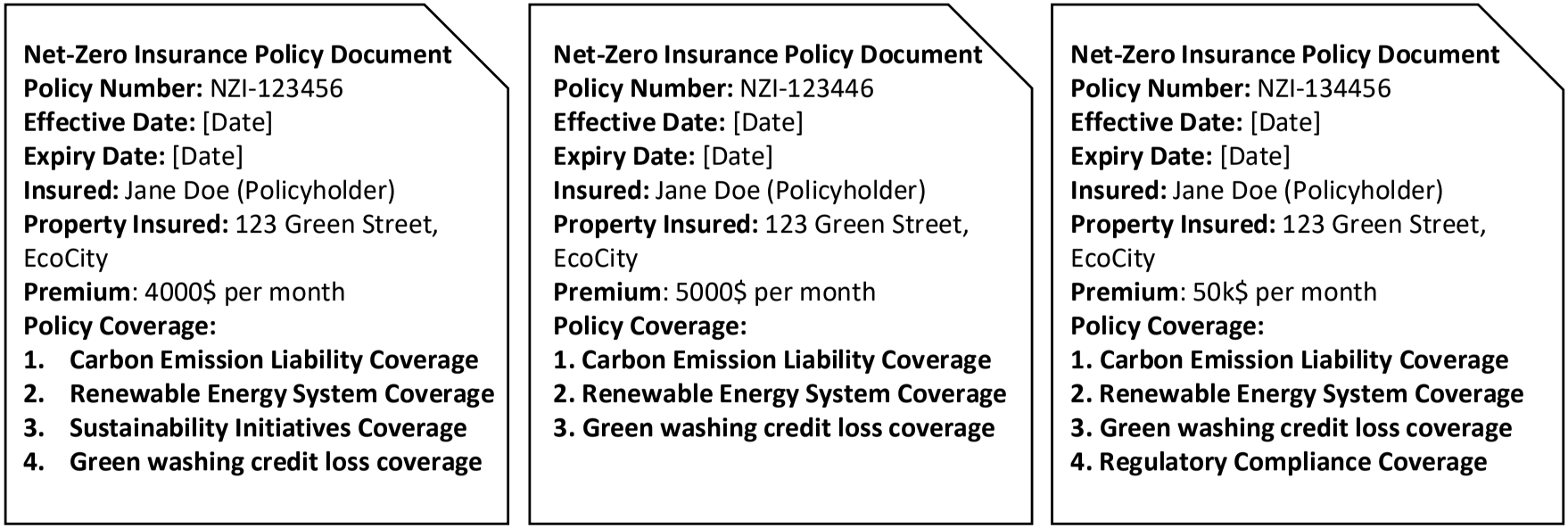
Net-Zero Insurance Policy Document
Policy Number: NZI-123456
Effective Date: [Date]
Expiry Date: [Date]
Insured: Jane Doe (Policyholder)
Property Insured: 123 Green Street, EcoCity
Premium: 4000$ per month
Policy Coverage:
1. **Carbon Emission Liability Coverage**
2. **Renewable Energy System Coverage**
3. **Sustainability Initiatives Coverage**
4. **Green washing credit loss coverage**
Net-Zero Insurance Policy Document
Policy Number: NZI-123446
Effective Date: [Date]
Expiry Date: [Date]
Insured: Jane Doe (Policyholder)
Property Insured: 123 Green Street, EcoCity
Premium: 5000$ per month
Policy Coverage:
1. **Carbon Emission Liability Coverage**
2. **Renewable Energy System Coverage**
3. **Green washing credit loss coverage**
Net-Zero Insurance Policy Document
Policy Number: NZI-134456
Effective Date: [Date]
Expiry Date: [Date]
Insured: Jane Doe (Policyholder)
Property Insured: 123 Green Street, EcoCity
Premium: 50k$ per month
Policy Coverage:
1. **Carbon Emission Liability Coverage**
2. **Renewable Energy System Coverage**
3. **Green washing credit loss coverage**
4. **Regulatory Compliance Coverage**

FIG. 5B

Time 5011	Estimated Carbon Removal per hour 5012	Estimated Carbon Emissions per hour 5013	Difference per hour 5014	Status per hour 5015
Tue, 30 Jan 2024 10:00:00 SGT	170kg	200kg	+30kg	Positive
Tue, 30 Jan 2024 11:00:00 SGT	200kg	180kg	-20kg	Negative
Tue, 30 Jan 2024 12:00:00 SGT	210kg	300kg	+90kg	Positive
Tue, 30 Jan 2024 13:00:00 SGT	230kg	200kg	-30kg	Negative
...	...	...	...	...

Dynamic removal and emission data 501

FIG. 6A

Time 5021	Dynamic Baseline estimation 5022	Estimated Carbon Emissions per hour 5023	Difference per hour 5024	Status per hour 5025
Tue, 30 Jan 2024 10:00:00 SGT	300kg	200kg	100kg	-33.33
Tue, 30 Jan 2024 11:00:00 SGT	290kg	280kg	10kg	-3.45
Tue, 30 Jan 2024 12:00:00 SGT	310kg	300kg	10kg	-3.25
Tue, 30 Jan 2024 13:00:00 SGT	300kg	200kg	100kg	-33.33
…	…	…	…	…

Dynamic Reduction data 502

FIG. 6B

Carbon reduction estimation 5031	Baseline 5032	Estimated Carbon Reduction 5033	Reduction % 5034
Use of ow emission construction material	300m kg	200m kg	33%
By building design	300m kg	200m kg	33%
Energy efficient windows	300m kg	200m kg	33%
Other sustainable practices	300m kg	200m kg	33%
...			

Long term reduction data 503

FIG. 6C

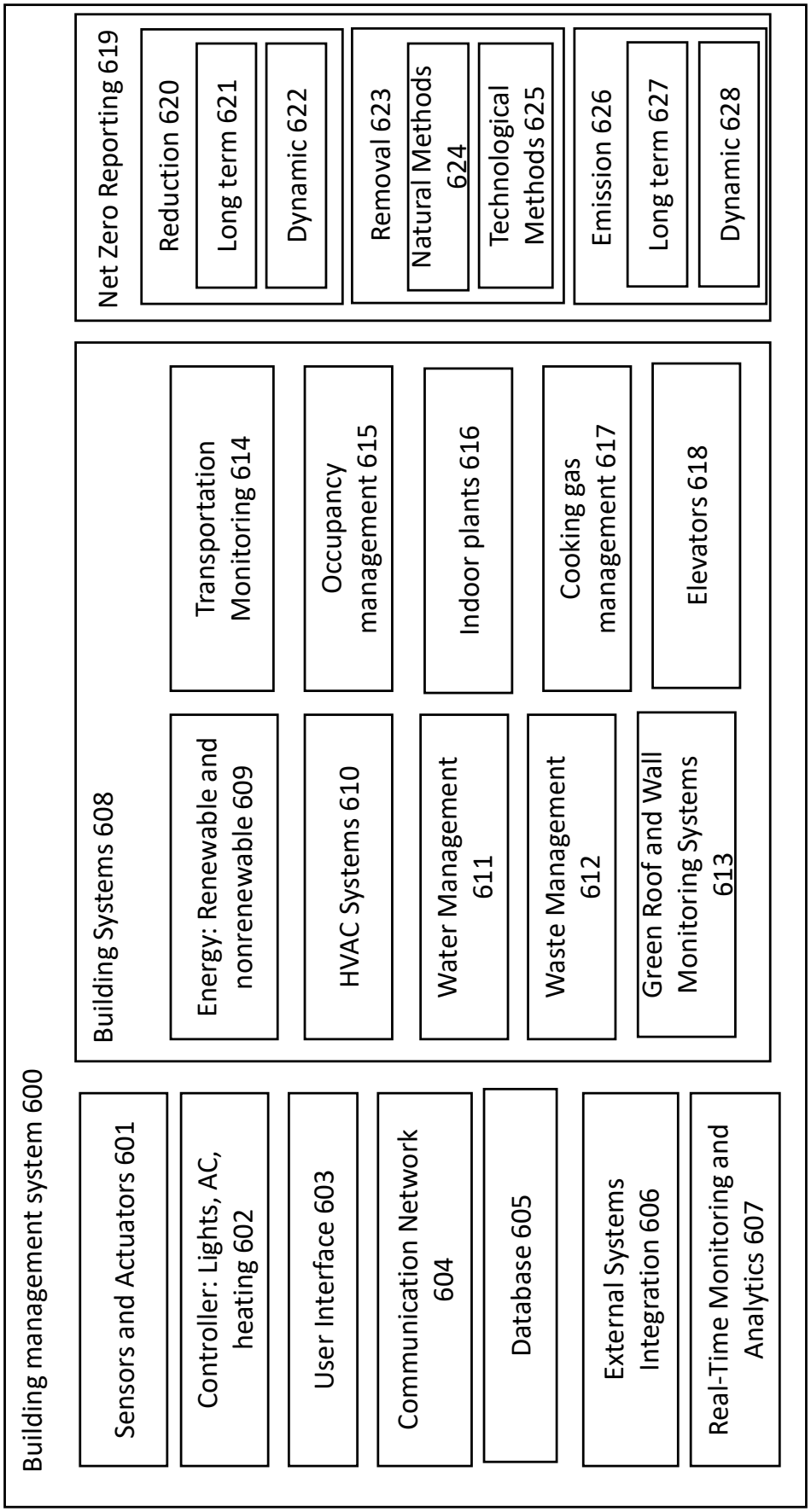
Building management system 600
Sensors and Actuators 601
Controller: Lights, AC, heating 602
User Interface 603
Communication Network 604
Database 605
External Systems Integration 606
Real-Time Monitoring and Analytics 607
Building Systems 608
Energy: Renewable and nonrenewable 609
HVAC Systems 610
Water Management 611
Waste Management 612
Green Roof and Wall Monitoring Systems 613
Transportation Monitoring 614
Occupancy management 615
Indoor plants 616
Cooking gas management 617
Elevators 618
Net Zero Reporting 619
Reduction 620
Long term 621
Dynamic 622
Removal 623
Natural Methods 624
Technological Methods 625
Emission 626
Long term 627
Dynamic 628

FIG. 7

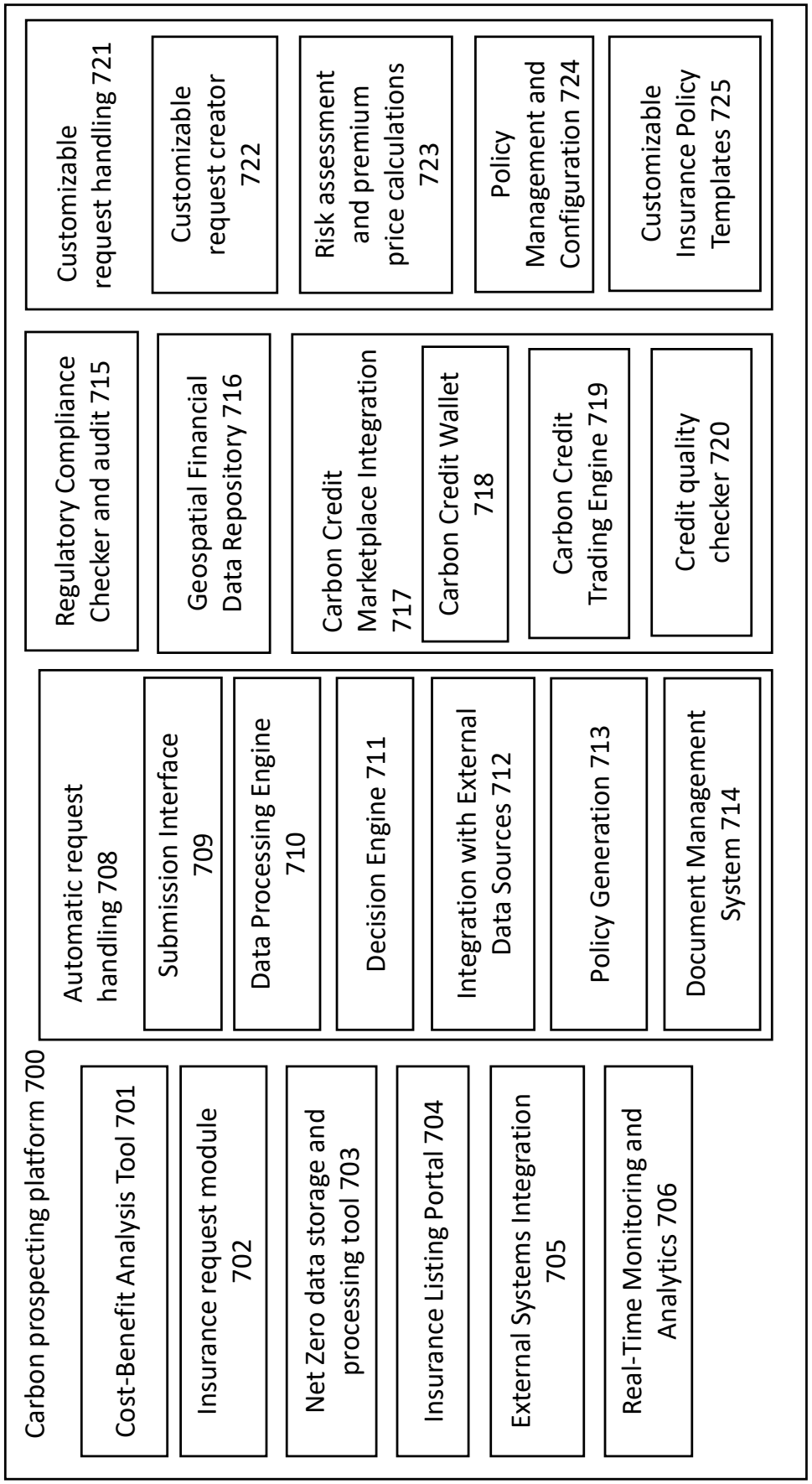
Carbon prospecting platform 700
Cost-Benefit Analysis Tool 701
Insurance request module 702
Net Zero data storage and processing tool 703
Insurance Listing Portal 704
External Systems Integration 705
Real-Time Monitoring and Analytics 706
Automatic request handling 708
Submission Interface 709
Data Processing Engine 710
Decision Engine 711
Integration with External Data Sources 712
Policy Generation 713
Document Management System 714
Regulatory Compliance Checker and audit 715
Geospatial Financial Data Repository 716
Carbon Credit Marketplace Integration 717
Carbon Credit Wallet 718
Carbon Credit Trading Engine 719
Credit quality checker 720
Customizable request handling 721
Customizable request creator 722
Risk assessment and premium price calculations 723
Policy Management and Configuration 724
Customizable Insurance Policy Templates 725

FIG. 8

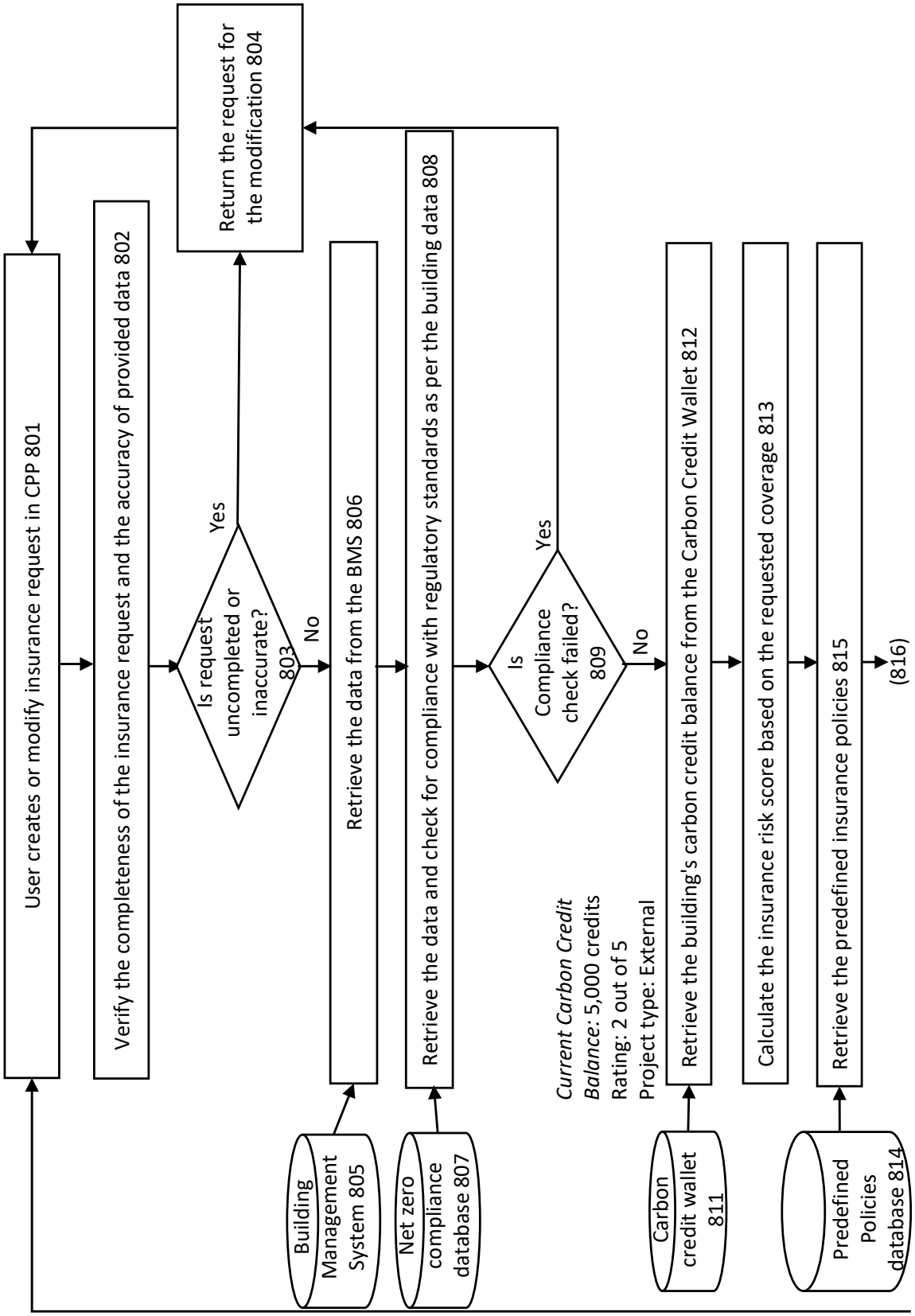
User creates or modify insurance request in CPP 801
Verify the completeness of the insurance request and the accuracy of provided data 802
Is request uncompleted or inaccurate? 803
Yes
No
Return the request for the modification 804
Retrieve the data from the BMS 806
Building Management System 805
Retrieve the data and check for compliance with regulatory standards as per the building data 808
Net zero compliance database 807
Is Compliance check failed? 809
Yes
No
Current Carbon Credit Balance: 5,000 credits
Rating: 2 out of 5
Project type: External
Retrieve the building's carbon credit balance from the Carbon Credit Wallet 812
Carbon credit wallet 811
Calculate the insurance risk score based on the requested coverage 813
Retrieve the predefined insurance policies 815
Predefined Policies database 814
(816)

FIG. 9A

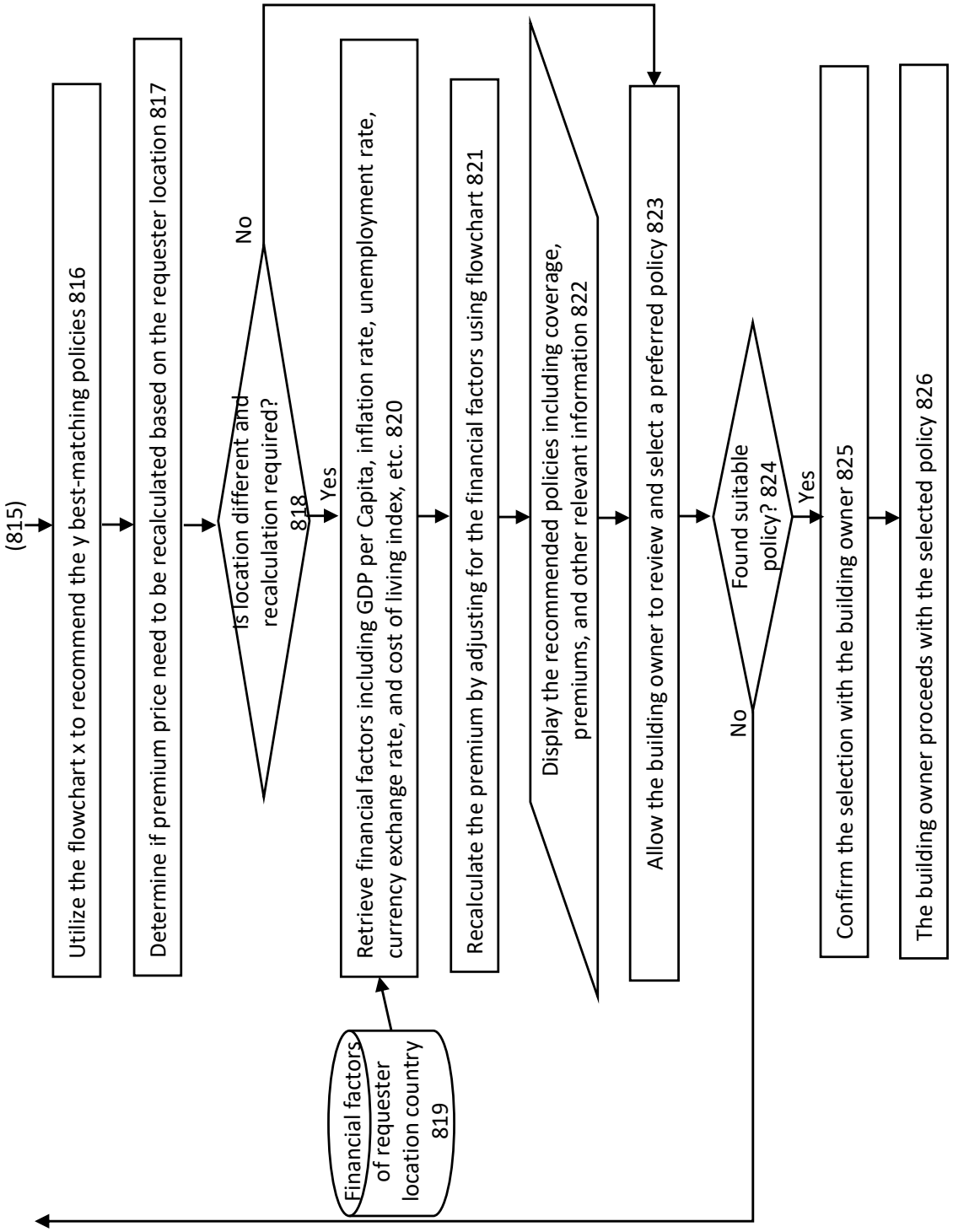
(815)
Utilize the flowchart x to recommend the y best-matching policies 816
Determine if premium price need to be recalculated based on the requester location 817
Is location different and recalculation required? 818
No
Yes
Retrieve financial factors including GDP per Capita, inflation rate, unemployment rate, currency exchange rate, and cost of living index, etc. 820
Financial factors of requester location country 819
Recalculate the premium by adjusting for the financial factors using flowchart 821
Display the recommended policies including coverage, premiums, and other relevant information 822
Allow the building owner to review and select a preferred policy 823
Found suitable policy? 824
No
Yes
Confirm the selection with the building owner 825
The building owner proceeds with the selected policy 826

FIG. 9B

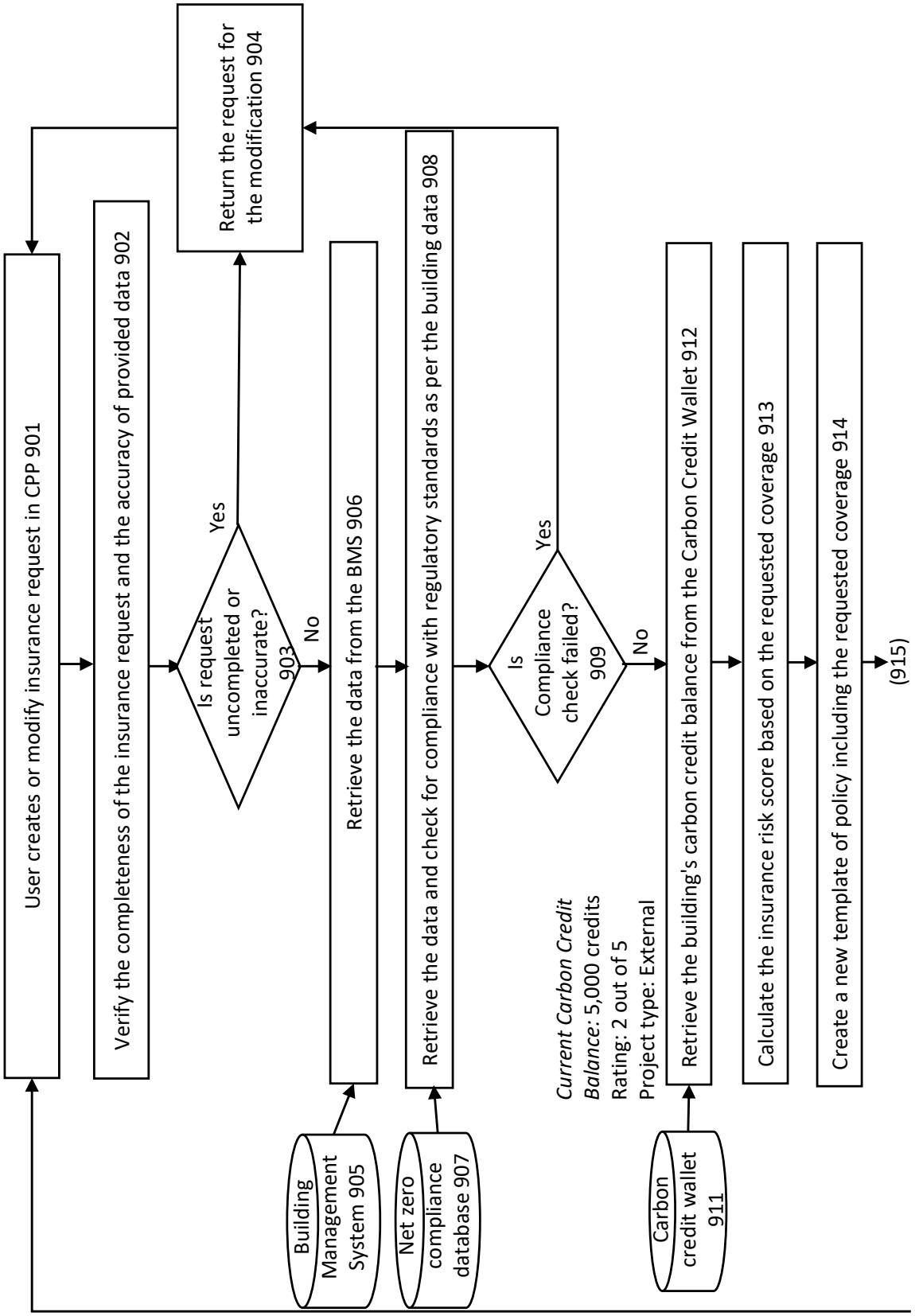
User creates or modify insurance request in CPP 901
Verify the completeness of the insurance request and the accuracy of provided data 902
Is request uncompleted or inaccurate? 903
Yes
No
Return the request for the modification 904
Retrieve the data from the BMS 906
Building Management System 905
Retrieve the data and check for compliance with regulatory standards as per the building data 908
Net zero compliance database 907
Is Compliance check failed? 909
Yes
No
Current Carbon Credit Balance: 5,000 credits
Rating: 2 out of 5
Project type: External
Retrieve the building's carbon credit balance from the Carbon Credit Wallet 912
Carbon credit wallet 911
Calculate the insurance risk score based on the requested coverage 913
Create a new template of policy including the requested coverage 914
(915)

FIG. 10A


(914)
Estimate the premium price, deductible and policy limit 915
Determine if premium price need to be recalculated based on the requester location 916
Is location different and recalculation required? 917
No
Yes
Retrieve financial factors including GDP per Capita, inflation rate, unemployment rate, currency exchange rate, and cost of living index, etc. 919
Financial factors of requester location country 918
Recalculate the premium price by adjusting for the financial factors using flowchart 920
Send the request to insurance company along with risk score and premium recommendation 921
Insurance companies creates the customized policy 922
Show the customized policy to the building owner 923
Confirm the selection with the building owner 924
Is policy acceptable? 925
No
Yes
The building owner proceeds with the selected policy 926

FIG. 10B

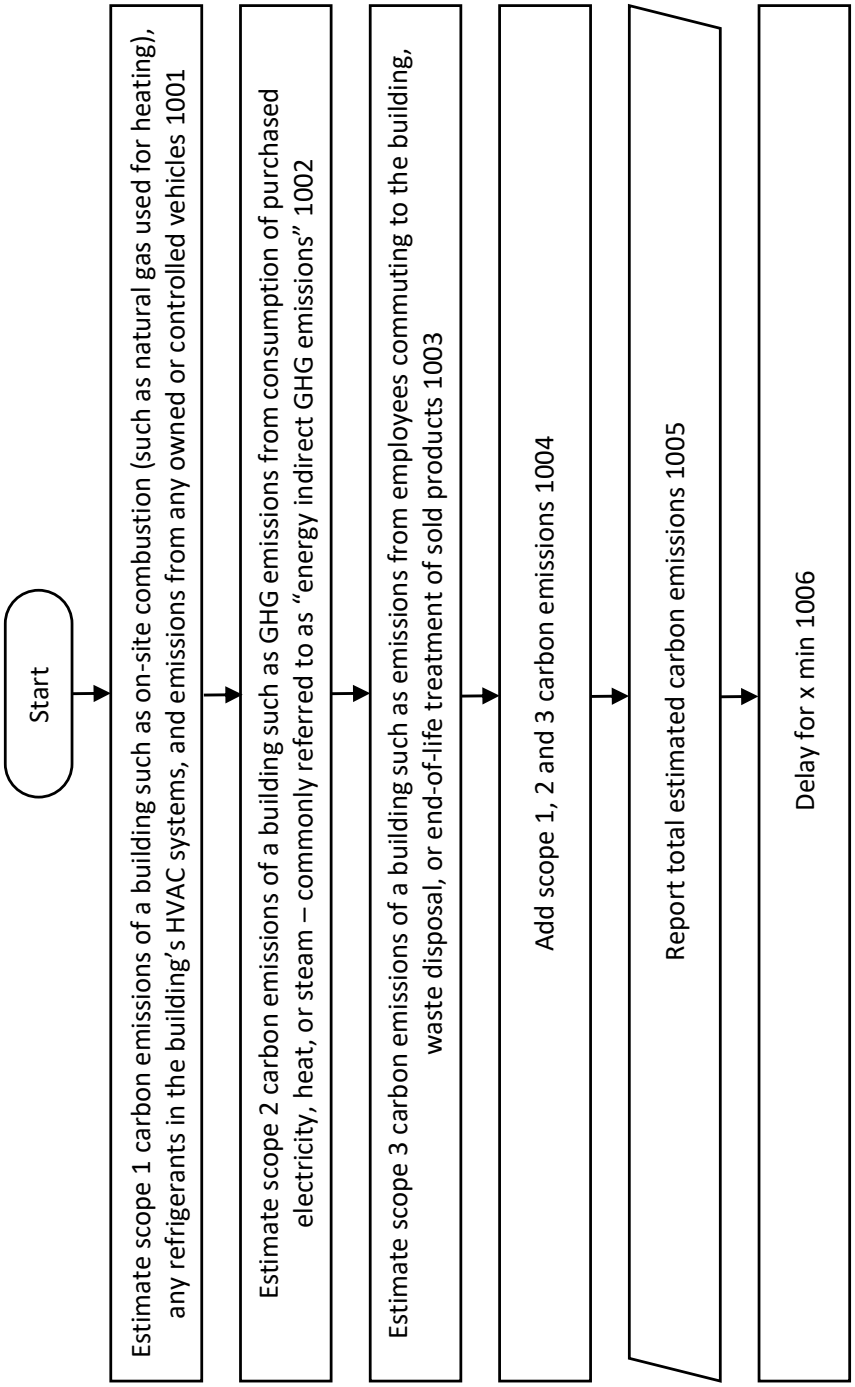
Start
Estimate scope 1 carbon emissions of a building such as on-site combustion (such as natural gas used for heating), any refrigerants in the building's HVAC systems, and emissions from any owned or controlled vehicles 1001
Estimate scope 2 carbon emissions of a building such as GHG emissions from consumption of purchased electricity, heat, or steam – commonly referred to as "energy indirect GHG emissions" 1002
Estimate scope 3 carbon emissions of a building such as emissions from employees commuting to the building, waste disposal, or end-of-life treatment of sold products 1003
Add scope 1, 2 and 3 carbon emissions 1004
Report total estimated carbon emissions 1005
Delay for x min 1006

FIG. 11

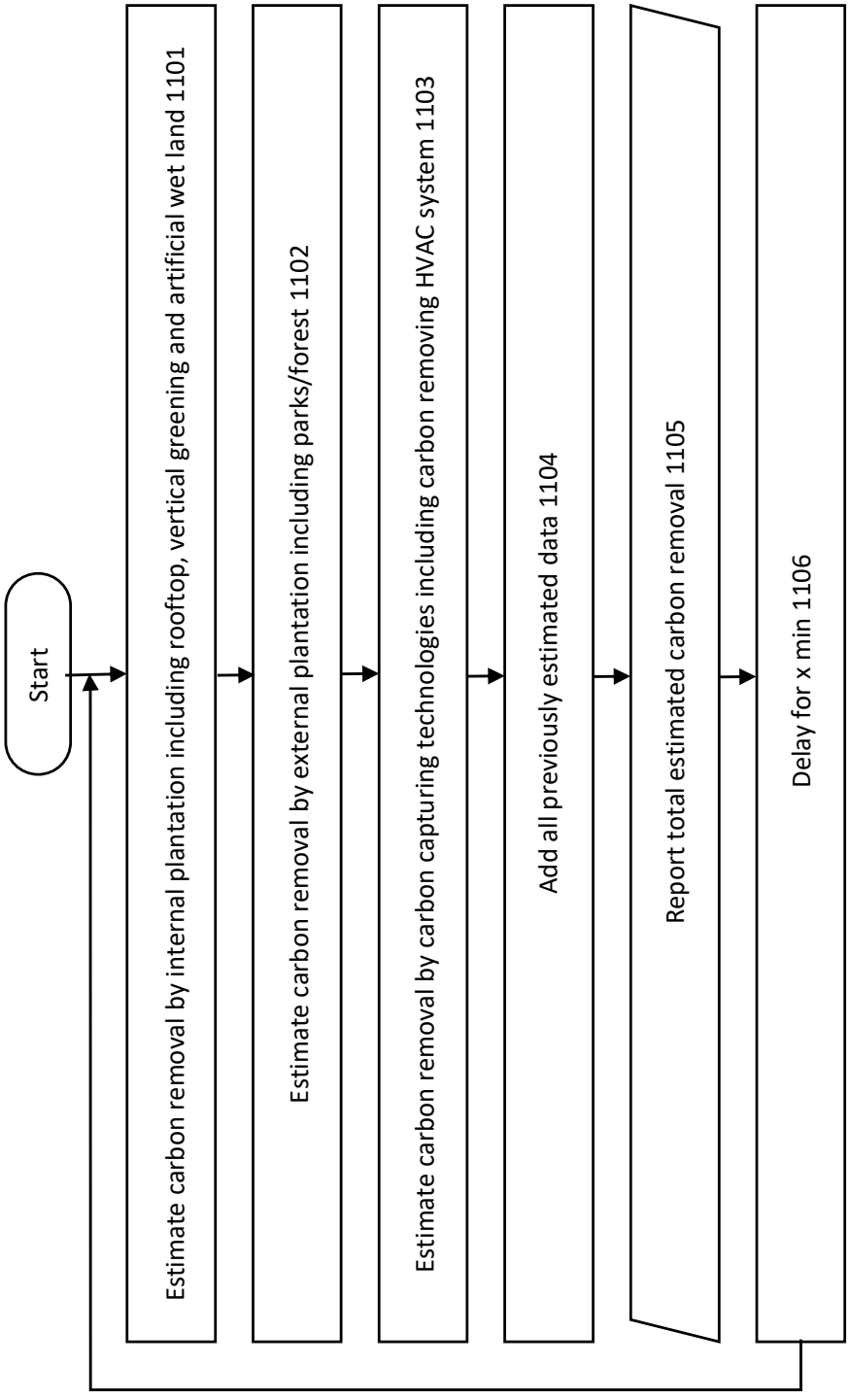
Start
Estimate carbon removal by internal plantation including rooftop, vertical greening and artificial wet land 1101
Estimate carbon removal by external plantation including parks/forest 1102
Estimate carbon removal by carbon capturing technologies including carbon removing HVAC system 1103
Add all previously estimated data 1104
Report total estimated carbon removal 1105
Delay for x min 1106

FIG. 12

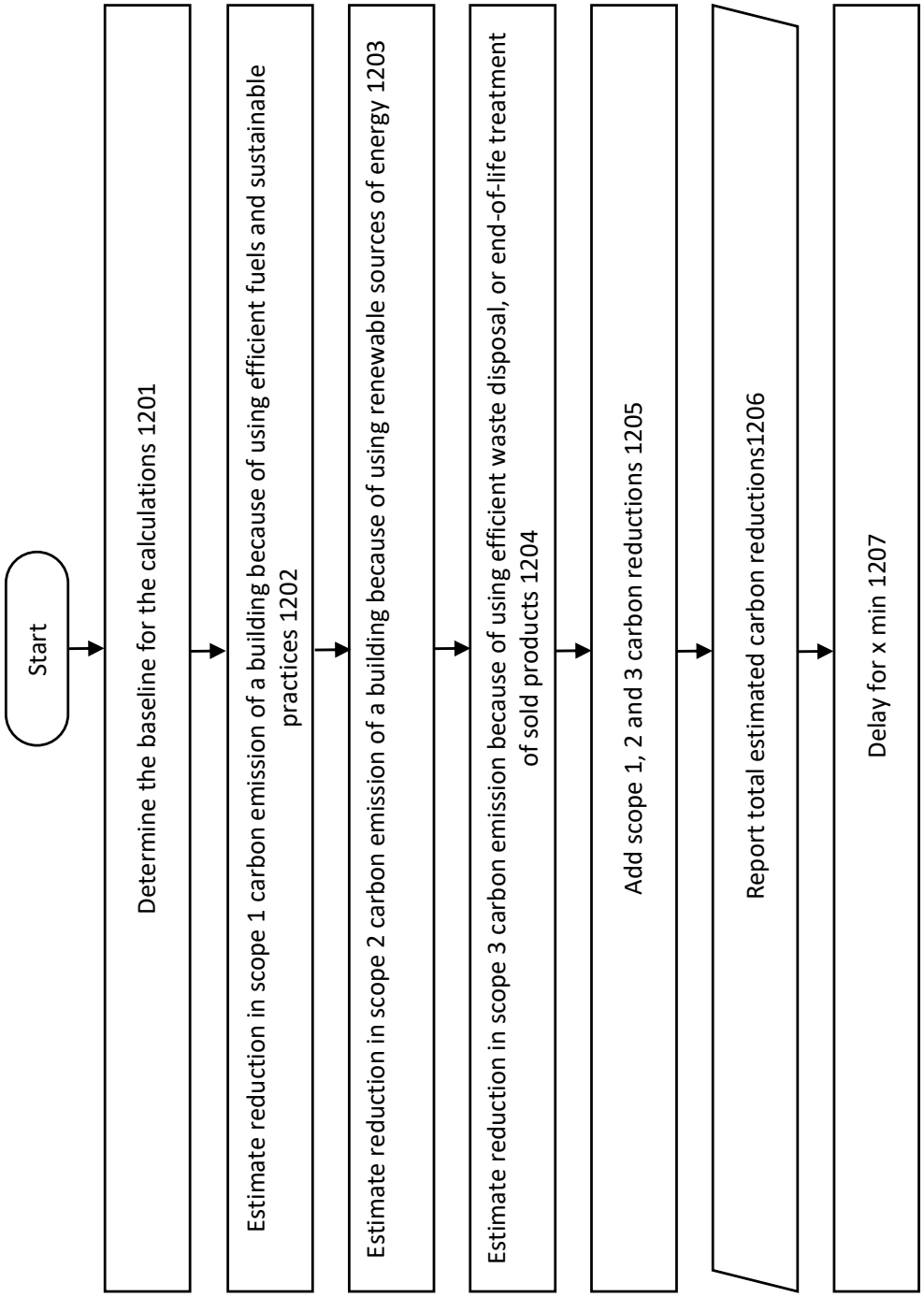
Start
Determine the baseline for the calculations 1201
Estimate reduction in scope 1 carbon emission of a building because of using efficient fuels and sustainable practices 1202
Estimate reduction in scope 2 carbon emission of a building because of using renewable sources of energy 1203
Estimate reduction in scope 3 carbon emission because of using efficient waste disposal, or end-of-life treatment of sold products 1204
Add scope 1, 2 and 3 carbon reductions 1205
Report total estimated carbon reductions1206
Delay for x min 1207

FIG. 13

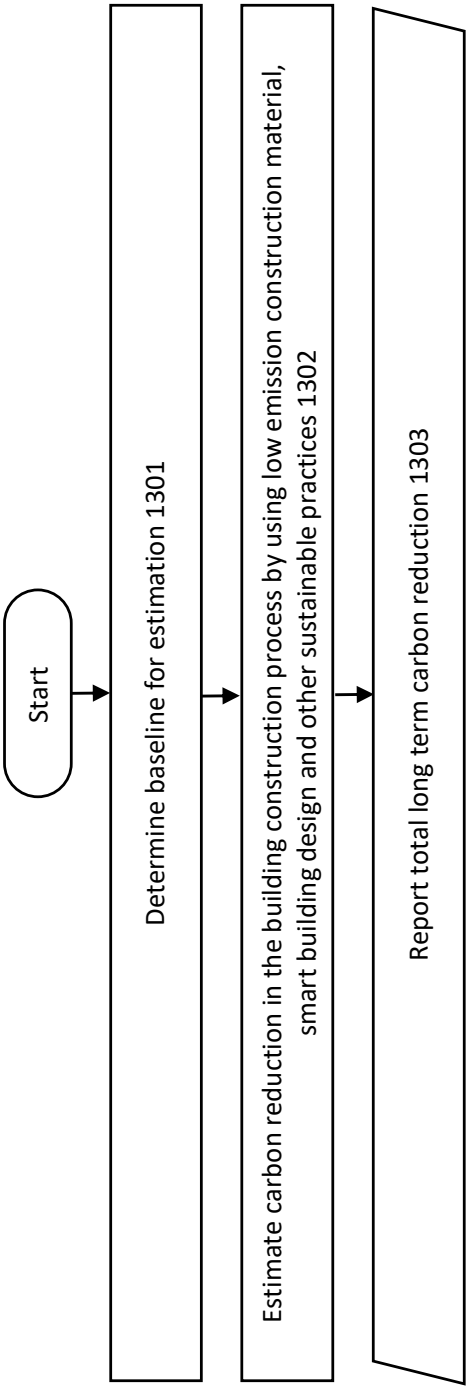
Start
Determine baseline for estimation 1301
Estimate carbon reduction in the building construction process by using low emission construction material, smart building design and other sustainable practices 1302
Report total long term carbon reduction 1303

FIG. 14


Get the pictures of the desired area 1401
Determine the area type 1402
Determine the number of plants Nx for species x 1403
Determine the photosynthetic activity Ax of one plant of species x (in terms of CO2 absorption per unit time) 1404
Determine be the average light exposure Lx for plants of species x per hour 1405
Determine temperature factor Ft, accounting for the impact of temperature on plant metabolism 1406
Determine the humidity factor Fh, considering the influence of humidity on plant transpiration and CO2 absorption 1407
Determine the maintenance factor Fm representing the impact of plant maintenance practices on photosynthetic activity 1408
Estimate CO2 absorption Rate Cx = Nx × Ax × Lx × Ft × Fh × Fm 1409
Estimate the added CO2 by respiration or biodegradation and remove it from net CO2 1410
Repeat this calculation for each plant species in the desired area, add it 1411

FIG. 15

Example of estimation of carbon removal by plantation

1501 Plant Species Information

15011	15012	15013	15014	15015	15016
Species	Number of Plants (Nx)	Photosynthetic Activity (Ax)	Average Light Exposure (Lx)	Temperature Factor (Ft)	Humidity Factor (Fh)
Species A	50	0.05 CO2/unit time	6 hours/day	0.8	0.9
Species B	30	0.08 CO2/unit time	5 hours/day	0.7	0.85
Species C	100	0.03 CO2/unit time	7 hours/day	0.85	0.95

1502 Calculation Results

15021	15022
Species	**CO2 Absorption Rate (Cx)** Cx = Nx * Ax * Lx * Ft * Fh
Species A	17.1
Species B	8.01
Species C	178.74

FIG. 16

Country	GDP per Capita (USD)	Inflation rate (%)	Unemployment rate (%)	Currency exchange rate (to USD)	Cost of living index
Country A	45,000	2.5	4	0.9	110
Country B	35,000	3	5.5	0.75	95
Country C	50,000	2	3.8	1.1	120
Country D	25,000	4.5	7.2	0.6	80
Country E	60,000	1.5	3	1.2	130
Country F	40,000	2.8	6	0.8	100

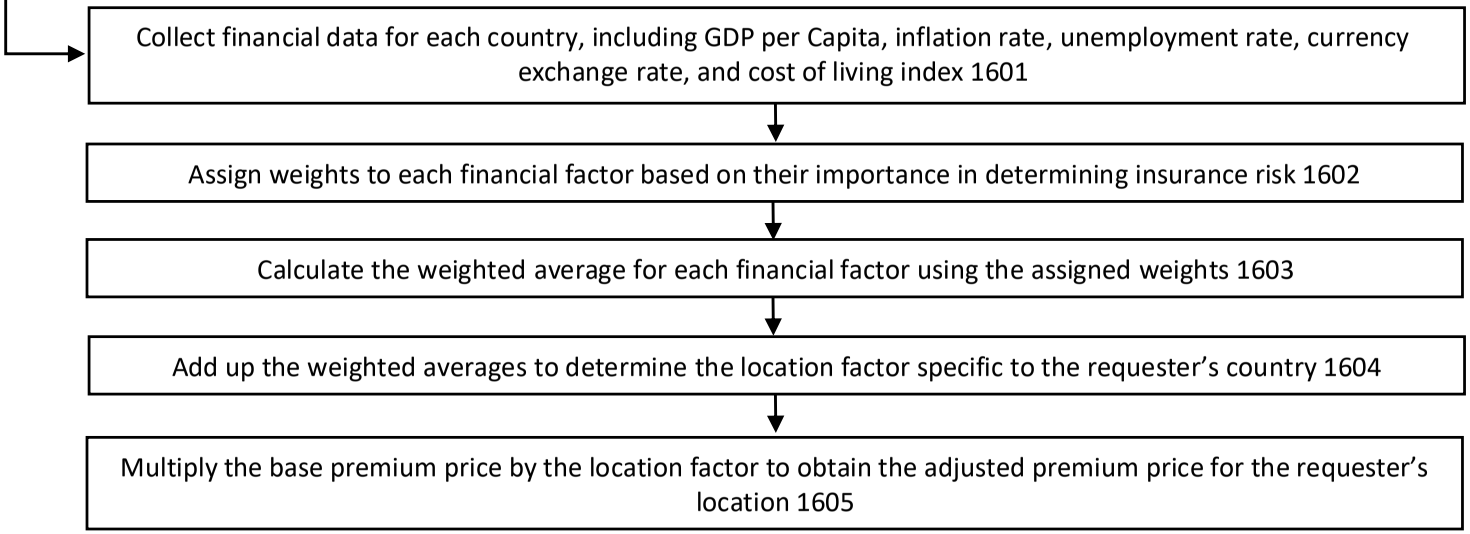

FIG. 17

Predefined policy table 1701

Policy Name 17011	Carbon offset coverage 17012	Net-zero guarantee 17013	Carbon emissions liability 17014	Green building certification 17015	Energy efficiency retrofit 17016	Base risk score 17017	Base premium price 17018	Base deductible 17019	Base policy limit 17020
Policy A	Yes	Yes	Yes	Yes	Yes	8	$5,000	$1,000	$100,000
Policy B	Yes	Yes	Yes	Yes	No	7	$4,500	$1,200	$80,000
Policy C	Yes	No	Yes	Yes	Yes	6	$4,200	$1,300	$120,000
Policy D	No	Yes	Yes	Yes	Yes	9	$5,500	$1,100	$150,000
Policy E	Yes	Yes	No	Yes	Yes	5	$4,000	$1,300	$70,000

FIG. 18A

Adjusted policy table 1702

Policy Name 17021	Carbon offset coverage 17022	Net-zero guarantee 17023	Carbon emissions liability 17024	Green building certification 17025	Energy efficiency retrofit 17026	Base risk score 17027	Base premium price 17028	Base deductible 17029	Base policy limit 17030	Adjusted premium price 17031	Adjusted deductible 17032	Adjusted policy limit 17033
Policy A	Yes	Yes	Yes	Yes	Yes	8	$5,000	$1,000	$100,000	$6,400	$800	$120,000
Policy B	Yes	Yes	Yes	Yes	No	7	$4,500	$1,200	$80,000	$5,600	$1,000	$80,000
Policy C	Yes	No	Yes	Yes	Yes	6	$4,200	$1,300	$120,000	$5,400	$1,100	$130,000
Policy D	No	Yes	Yes	Yes	Yes	9	$5,500	$1,100	$150,000	$7,300	$900	$140,000
Policy E	Yes	Yes	No	Yes	Yes	5	$4,000	$1,300	$70,000	$5,200	$1,100	$80,000

FIG. 18B

Carbon credit wallet Example

1801	1802	1803	1804	1805	1806
Building ID	**Building Name**	**Location**	**Carbon Credits Held**	**Carbon Credit Rating**	**Project Type**
BI-001	Alpha Corp HQ	New York, USA	2000	AA	External
BI-002	Beta Industries Plant	London, UK	3000	AAA	Internal
BI-003	Gamma Buildings	Sydney, Australia	1500	A+	External
BI-004	Delta Towers	Tokyo, Japan	1000	BB	Internal
BI-005	Epsilon Enterprises	Paris, France	2500	AAA	External
BI-006	Zeta Factory	Toronto, Canada	4000	A	Internal
BI-007	Eta Complex	Berlin, Germany	3500	AA	External
BI-008	Theta Mall	Madrid, Spain	2000	BBB	Internal
BI-009	Iota Inc	Mumbai, India	1800	A+	External
BI-010	Kappa Corp	Barcelona, Spain	2250	AA	Internal

FIG. 19

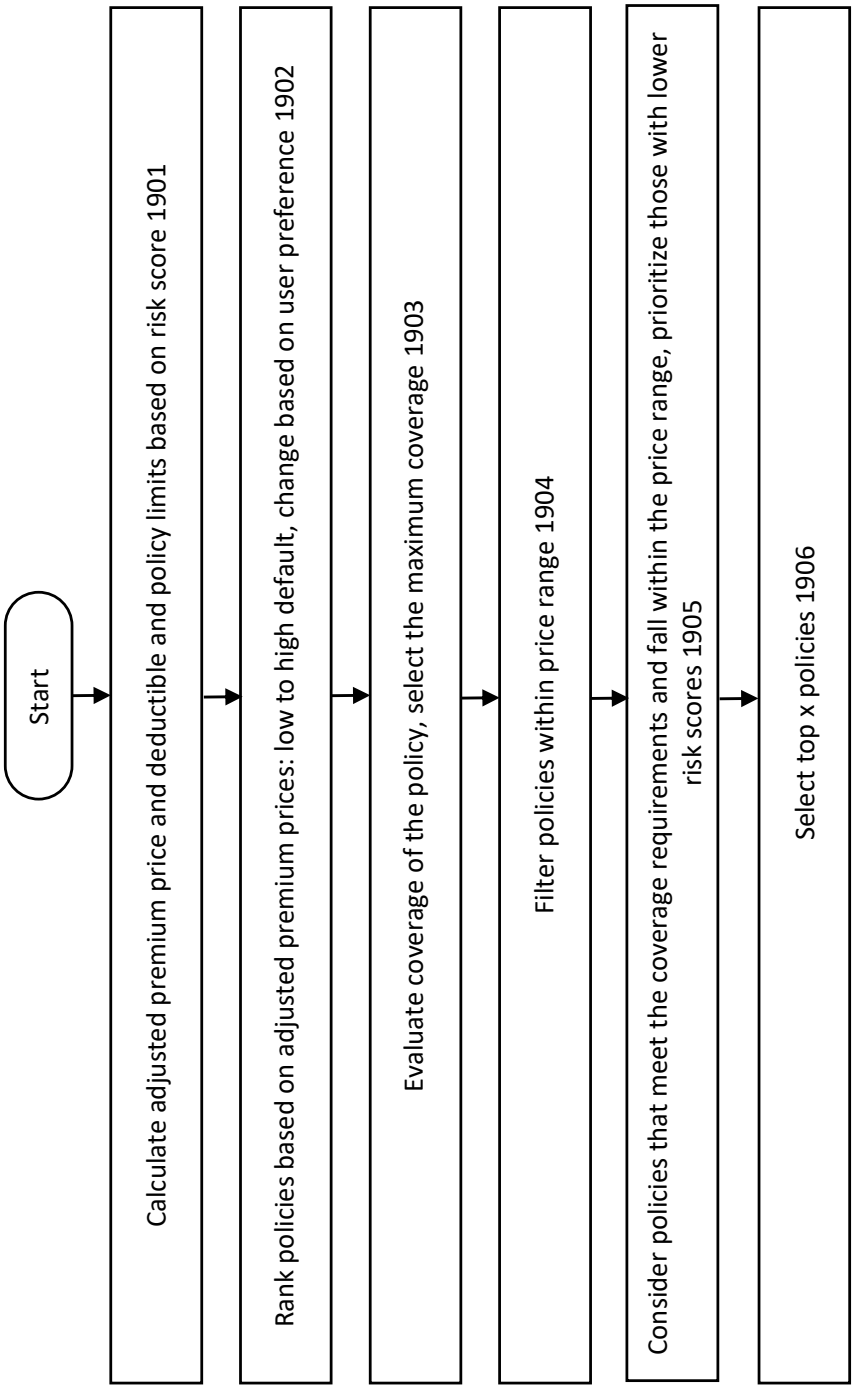
Start
Calculate adjusted premium price and deductible and policy limits based on risk score 1901
Rank policies based on adjusted premium prices: low to high default, change based on user preference 1902
Evaluate coverage of the policy, select the maximum coverage 1903
Filter policies within price range 1904
Consider policies that meet the coverage requirements and fall within the price range, prioritize those with lower risk scores 1905
Select top x policies 1906

FIG. 20

Coverage name	Risk Score	Risk assessment
Carbon offsetting coverage	Risk Score = (Weight1 * (Net Emissions rate) + (Weight2 * (100 – Net reduction rate)) + (Weight3 * Credit Balance) - (Weight4 * Credit Rating) + (Weight5 if Reliance on External Projects, 0 otherwise)	**High Risk:** Buildings with high historical carbon emissions, low effectiveness of carbon reduction measures, a low current carbon credit balance, lower-rated carbon offset projects, and reliance on external projects. **Medium Risk:** Buildings with moderate historical carbon emissions, moderate effectiveness of carbon reduction measures, a moderate current carbon credit balance, medium-rated carbon offset projects, and a mix of internal and external projects. **Low Risk:** Buildings with low historical carbon emissions, high effectiveness of carbon reduction and removal measures, a high current carbon credit balance, higher-rated carbon offset projects, and reliance on internal projects.
Carbon Emissions Liability	Risk Score = (Emission Variability * Weight1) + (Emission Trend * Weight2) + (Regulatory Compliance * Weight3)	**High Risk:** When the cumulative risk score exceeds a predetermined threshold, indicating a high likelihood of exceeding emissions limits or facing penalties for non-compliance. **Moderate Risk:** When the cumulative risk score falls within a moderate range, suggesting a moderate probability of exceeding emissions limits or facing penalties. **Low Risk:** When the cumulative risk score is below a predetermined threshold, indicating a low likelihood of exceeding emissions limits or facing penalties.
Net Zero Performance Guarantee	Risk Score = (Overall performance risk score* Weight1) + (Quality Factor * Weight2) + (Quantity Factor * Weight3) Overall performance risk Score = (Σ (Actual Performance - Expected Performance) / Expected Performance) * Weight	**High Risk:** When the cumulative risk score exceeds a predetermined threshold, indicating significant deviations in net zero performance and lower-quality or insufficient quantity of carbon credits. **Moderate Risk**: When the cumulative risk score falls within a moderate range, suggesting some deviations from net zero targets but sufficient quantity and quality of carbon credits to mitigate risks. **Low Risk:** When the cumulative risk score is below a predetermined threshold, indicating minimal deviations from net zero targets and sufficient quantity and quality of carbon credits to maintain net zero status effectively.
Energy Efficiency Retrofit	Risk Score = (Installation Complexity * Weight1) + (Maintenance Intensity * Weight2) + (Technology Reliability * Weight3) + (Location Vulnerability * Weight4)	**High Risk**: High complexity, maintenance intensity, technology unreliability, and location vulnerability. Systems with these characteristics are more likely to experience operational disruptions, failures, and associated financial losses, resulting in high risk. **Medium Risk**: Moderate levels across all factors. **Low Risk:** Low complexity, maintenance intensity, technology reliability, and location vulnerability
Green Building Certification	$RiskScore = \sum_{i=1}^{n} (w_i x R_i)$	**High risk:** Frequent claims, older buildings, hazardous locations, non-compliance issues, and volatile occupancy. **Medium risk**: Moderate claims, average age and construction, moderate environmental risks, basic compliance, and stable occupancy. **Low risk:** Clean claims history, newer construction, minimal environmental risks, strong compliance, and stable occupancy patterns.

FIG. 21

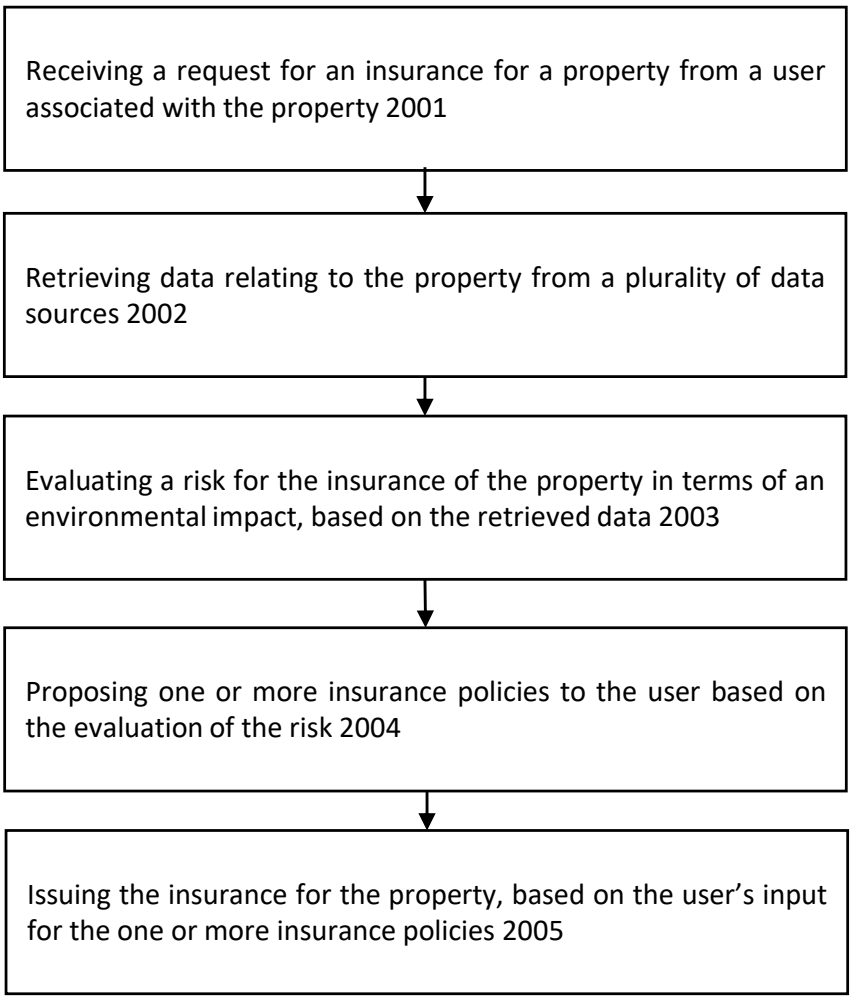
Receiving a request for an insurance for a property from a user associated with the property 2001
Retrieving data relating to the property from a plurality of data sources 2002
Evaluating a risk for the insurance of the property in terms of an environmental impact, based on the retrieved data 2003
Proposing one or more insurance policies to the user based on the evaluation of the risk 2004
Issuing the insurance for the property, based on the user's input for the one or more insurance policies 2005

FIG. 22