HERE'S WHY

Climate Data is the Next Big Thing for **Wearable Tech**

Executive summary

Every smart wearable company's business goal is to lead in innovation and capture a large market share with compelling features that appeal to consumers. However, this market is largely feature-sensitive, and users demand constant personalized insights into their health and well-being. While accounting for health-focused features, the impact of climate on health cannot be ignored.

This whitepaper discusses how health and wellness will be crucial for the success of smart wearable products and highlights some hitherto unexplored applications of climate intelligence integration within these devices. We investigate whether consumers of smart wearables are truly gaining actionable insights from the environment and climate they interact with 24/7.

While common marketed features of smart wearables include heart rate monitoring, SpO_2 levels, and sleep tracking, there remains a gap in addressing how climate influences these aspects. Our report further explores how these gaps can be bridged by offering personalized climate insights, such as smart navigation and wellness tracking, to gain a business advantage with reliable climate data delivered at the right time.

Content

The critical role of health and wellness features in smart wearables

Innovation in sensors and AI helps millions detect and manage health conditions. Deloitte predicts that consumer health and wellness wearables shipments will touch 440 million units by the end of this year (2024), showing just how much variety there is in this market.

Though innovation is often associated with technological advancement, where consumers adapt to technology, in the case of smart wearables, demographic and psychographic factors, like taking ownership of health and well-being, are promising indicators for innovation across the smart wearables value chain.

This has been reflected in significant product adoption, especially post-COVID-19 when the shift of consumers began. As an NIH-published study states, **"long COVID consequences have changed the perception towards disease management, and it is moving towards personal healthcare monitoring. In this regard, wearable devices have revolutionized the personal healthcare sector to track and monitor physiological parameters of the human body continuously."**

Today, smart wearables have expanded greatly from smartwatches to fitness trackers, smart jewelry to smart clothing, and step trackers to wearable medical devices.

Asia-Pacific consumers, especially Gen Z, are taking greater ownership of health and well-being.

- Bain & Company

One of the most significant features of smart wearables—such as smartwatches, fitness trackers, and wearable medical devices—is heart health monitoring. These devices now come equipped withbuilt-in ECG (electrocardiogram) capabilities, enabling them to monitor heart rate variability and rhythms and detect irregularities. Furthermore, innovative features like blood oxygen saturation monitoring and sleep tracking, as seen in devices from Garmin and Apple, set the stage for future advancements, leveraging these foundational capabilities.
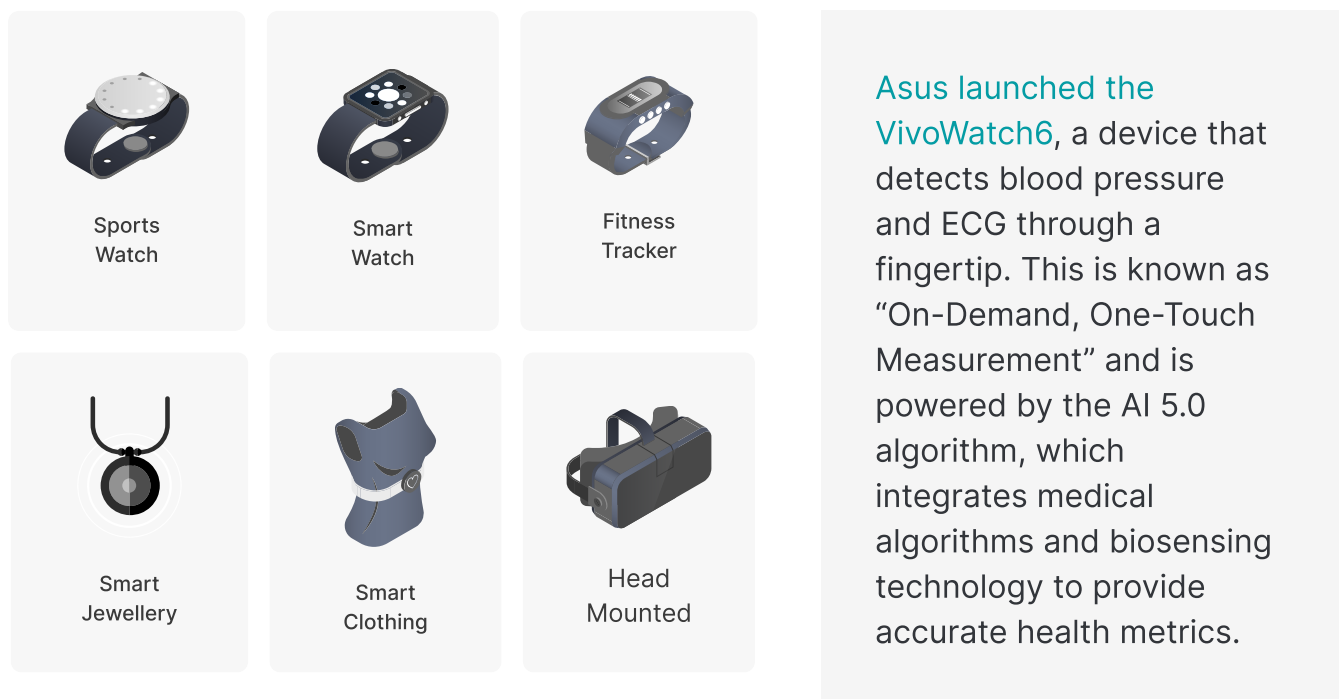

Sports Watch	Smart Watch	Fitness Tracker
Smart Jewellery	Smart Clothing	Head Mounted

Fig 1: Types of wearable devices

Asus launched the VivoWatch6, a device that detects blood pressure and ECG through a fingertip. This is known as "On-Demand, One-Touch Measurement" and is powered by the AI 5.0 algorithm, which integrates medical algorithms and biosensing technology to provide accurate health metrics.

All of these fundamentals, which include body composition analysis, emotion and stress management, sleep tracking, menstrual cycle monitoring, relaxation index, momentary emotion tracking, and body harmony analysis, offer comprehensive solutions for all-day health management.

Gartner spending by wearable type indicates a clear economic observation: In just four years, end-user spending on wearables doubled worldwide, justifying the previously mentioned point about consumers taking ownership of their health and well-being.

Worldwide wearable devices end-user spending by type, 2019-2022 (Millions of dollars)

Device Type	2019	2020	2021	2022
Smartwatch	18,501	21,758	25,827	31,337
Wristband	5,101	4,987	4,906	4,477
Ear-worn	14,583	32,724	39,220	44,160
Head-mounted display	2,777	3,414	4,054	4,573
Smart clothing	1,333	1,411	1,529	2,160
Smart patches	3,900	4,690	5,963	7,150
Total	**46,194**	**68,985**	**81,499**	**93,858**

Fig 2: Gartner worldwide wearables device end-user spending

Companies like Garmin, Fitbit (now part of Google), Strava, Peloton, Samsung, and Apple are known for spending millions on innovation. Interestingly, their focus has also moved more toward the health and well-being of consumers. Garmin offers sleep tracking by understanding key sleep stages through a combination of heart rates, heart rate variability, and body movement, and Apple Watches offers an ECG app and AFib history.

Considering "all-day health management" through smart wearables as a challenge, companies like Samsung, Apple, and Amazon have expressed serious ambitions in health and wellness. For instance, Samsung is focusing on fragmented data to simplify wellness on Galaxy wearables by turning data into meaningful insights with transformative AI using more data and greater intelligence, making a battleground to innovate and deliver to capture a larger market share. While, all the innovations transforming smart wearables fundamentally rely on health factors, data intelligence, and artificial intelligence as their foundation. Climate considerations are often treated as minor contributors within this ecosystem, applied mainly to small use cases like temperature, weather, and humidity alerts.

This raises the question: Are consumers truly getting the most out of their smart wearables when living in the era of climate change?

Climate change is establishing a new healthcare norm for consumers, as its extensive impacts permeate every facet of human health. These effects actively influence everything from breathing to sleep patterns, placing nearly everyone in the world at some level of risk.

Increasing pollen

- Allergic rhinitis
- Asthma
- Sleep health
- Skin conditions

Rising temperature

- Cardiac stress
- Productivity
- Infection susceptibility
- Outdoor activity

Worsening air quality

- Asthma
- Respiratory conditions
- Fitness & athletic performance
- Skin conditions
- Mental health

Severe climate events

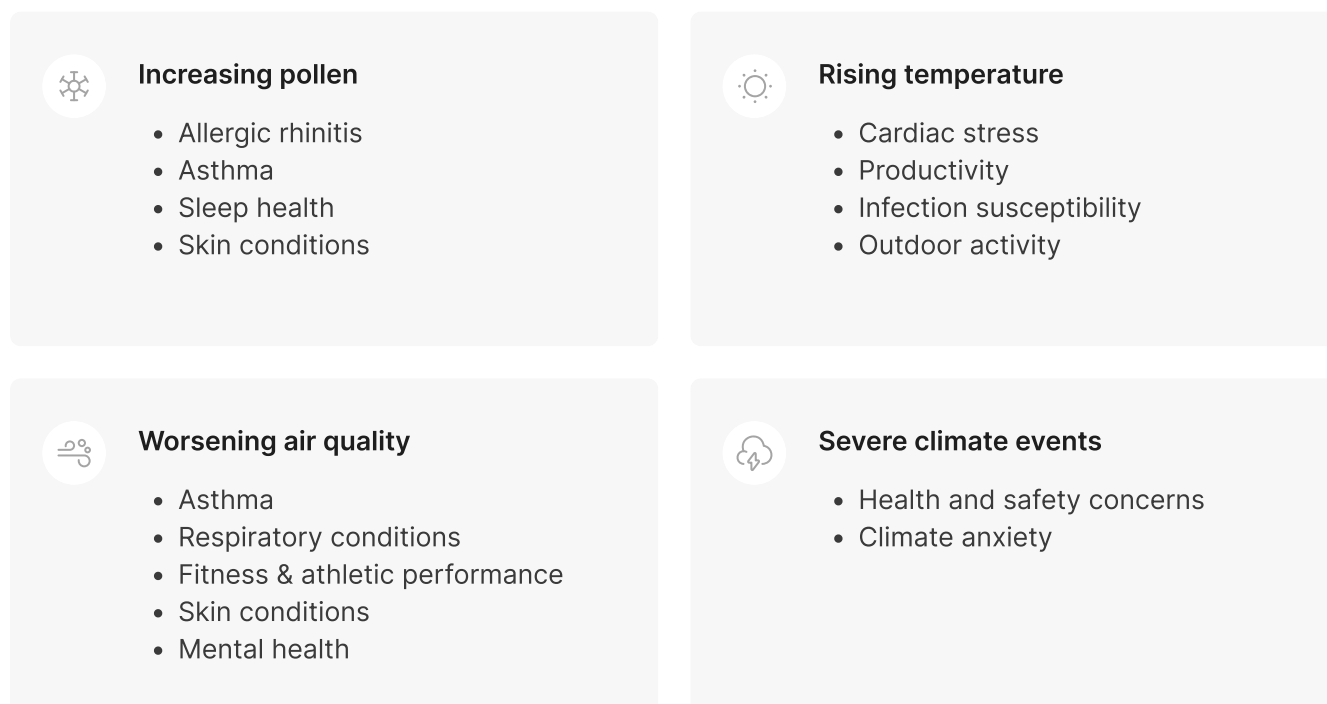- Health and safety concerns
- Climate anxiety

Fig 3: Environmental factors affecting health conditions

As depicted in Figure 3, rising temperatures affect cardiac stress, productivity, and outdoor activities. Increased pollen levels correlate with sleep health issues and asthma. Worsening air quality affects fitness, athletic performance, respiratory conditions, and mental health.

In fact, research by the World Health Organization (WHO) indicates that 3.6 billion people, or 45% of the world population as of 2024, live in areas highly susceptible to climate change. While climate change primarily impacts health, its significance in the context of smart wearables remains somewhat underestimated, suggesting a need for greater emphasis on integrating climate-related factors into these technologies.

Maximizing wearable utility for climate-conscious consumers

It is clear that the environment and surroundings significantly influence human health and well-being, and climate change will continue to impact these factors. But are consumers getting the most out of their wearables? To understand this, let's understand: Why do consumers buy smart wearables?

Consumers seek holistic and personalized health and wellness support

Track fitness & activities	Sleep management	Wearable medical device
• Fitness tracking • Activity monitoring • Heart rate monitoring	• Sleep tracking • Sleep score • Sleep insights	• Health monitoring • Medication reminder • Health status detection

Apps & appliance integration	Tech-enabled eyewear	Smart clothing
• Health apps integration • Media control • Smart homes & IoT integration	• Augmented reality apps • Health data display • Hands-free communication	• Thermochromic fabrics • Antimicrobial fabrics • Anaerobic info

Smart automated payments
• Contactless payment rings • Access cards • Gesture recognition

People buy smart wearables for various reasons, but broadly, this segment is very feature-sensitive. Consumers are drawn to smart wearables primarily because of their ability to monitor health metrics, track fitness goals, provide convenience, and enhance productivity. A range of functionalities as mentioned above, such as heart rate monitoring, sleep tracking, step counting, and notifications, appeal to users looking to optimize their health and daily routines.

However, the biggest factors that heavily impact expectations are often underutilized, **i.e., climate change is transforming the very reason why people buy smart wearable products.** Factors like the climate and environment, which significantly influence sleep, health, and fitness monitoring, are rapidly evolving yet often overlooked.

For instance, the European Society of Cardiology Journal states that "Heat exposure can increase skin blood flow and sweating to lower the body's core temperature. In response, the sympathetic nervous system is activated to maintain cardiac output through a compensatory increase in cardiac workloads, such as increases in heart rate and stroke volume." Heart Failure (HF) has been identified as an independent prognostic factor in heatstroke-related deaths. Further, the journal states heat-drug interaction – heat can affect drug absorption,

According to a survey by the American Psychological Association, more than two-thirds of Americans experience some climate anxiety. Children and young adults are also particularly vulnerable to the effects of chronic stress, and climate anxiety may affect their risk of developing depression, anxiety, and substance use disorders.

distribution, elimination, and, subsequently, the therapeutic response.

The climate angle in wearables will act as a preventative measure to identify and provide proactive actionable insights, as highlighted in the European Society of Cardiology journal and the American Psychological Association study of climate roles in heart and mental health. This underscores that climate data is still underutilized for these intelligent use cases for health and well-being.

Until here, it becomes clear that climate change is reshaping consumer needs. Understanding how these environmental shifts influence purchasing decisions is crucial for developing products that meet evolving demand. Let's see how climate change shapes consumer needs in detail.

How climate change shapes consumer needs
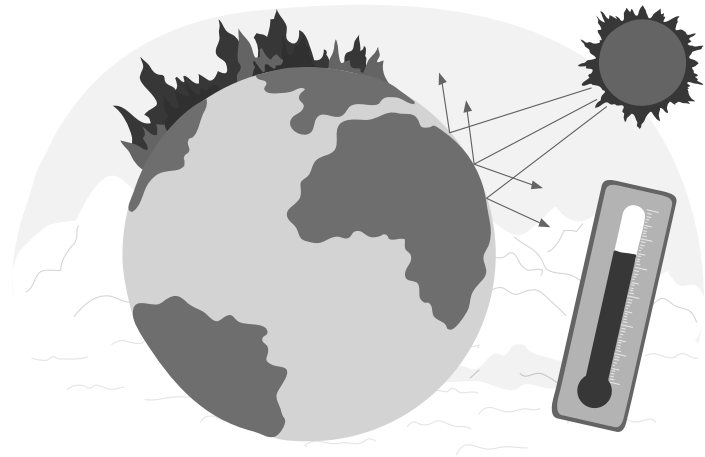
Fitness performance & Cardiac impact

• Moderate air pollution decreases peak athletic performance.
• Air pollution speeds up arterial atherosclerosis and raises cardiac event risks.
• Extreme heal increase cardiac workload during exercise.
(source: American College of Cardiology)

Allergies

• Climate change affects pollen and fungal spore production and composition.
• Longer pollen seasons intensify conditions like rhinitis, conjunctivitis and asthma.
• Greenhouse gases worsen asthma and lung diseases, reducing lung function.
(source: American Academy of Allergy Asthma & Immunology)

Sleeping conditions

• Temperature increases linked to larger sleep deficits
• Anthropogenic changes likely harm human sleep due to urbanization patterns impact
• Monotic decline in sleep duration as night-time temperature increased.
(source: Sleep Medicine Reviews . Vol . 75 . Jun 2024, Science Direct)

Chronic conditions

• Increased air pollution and wildfires worsen asthma and COPD
• Hypertension, diabetes, and COPD are particularly vulnerable.
• Vulnerable individuals are prone to heat, insect and water-related illnesses.
(source: United States Environmental Protection Agency)

Mental health

• Air pollution and extreme temperatures impair cognitive function, affecting attention, memory & information processing.
• High concentrations of pollutants are linked to headaches, psychiatrics distress and increased risk of depression.
• Extreme temperatures & pollution impair neurological develpments, neuroinflammation linked to Alzheimer & Dementias.
(source: Yale School of Public Health)

Fig 4: Climate impacts on consumer health, various studies.

Figure 4. highlights the influence of climate change on health. Rising air pollution and extreme heat affect cardiac health by increasing cardiac strain and reducing fitness performance performed in a particular environment. It exacerbates allergies through pollen and fungal spore production, leading to reduced respiratory and lung function.Climate change worsens risks vulnerable individuals are prone to chronic illness.

The climate also impacts the monotonic decline in sleep quality. As mentioned, air pollution impacts cognitive function, affecting memory and information processing. These connections show how climate change is shaping consumer needs.

CASE IN POINT

How juli eases mental health conditions with Ambee's climate data

Juli, a digital health firm, partnered with Ambee to integrate air quality and pollen data into their platform, fine-tuning health recommendations with hyperlocal environmental insights.

As a result, Juli users gained more control over their physical and mental health, leading to significantly improved consumer engagement and app retention.

Read full insight →

juli

Take the Ambee and Juli partnership (Case in point) as an example, which aims to address the impact of air pollution and pollen density on health. Recognizing that air pollution contributes to chronic health conditions and millions of deaths annually, Juli, a digital health company, has integrated Ambee's air quality and pollen data into its platform.

This integration allows Juli's customers to understand how environmental factors affect their health and manage their conditions with data-driven insights. As a result, Juli has seen increased app retention and customer engagement. The

platform's AI uses Ambee's hyperlocal data to create personalized health recommendations, helping users prevent health complications by predictingtriggers and providing guidance tailored to their immediate environment.

To put it briefly, climate change impacts consumer health (Fig 4)., and how consumers seek holistic and personalized health and wellness support shows that health needs impacted by climate change present an opportunity for innovation in smart wearables.

Leveraging emerging health needs for wearable innovation

Wearables integrated with climate insights could provide users with a comprehensive understanding of their health and environmental factors. Devices offering such a comprehensive understanding empower individuals to adjust their activities and optimize their well-being accordingly.

For example, integrating climate datasets into wearable devices can provide insights into users' exposure to temperature during fitness activities, assess pollen risk levels impacting lung health, monitor anthropogenic changes affecting sleep patterns, and track concentrations of pollutants associated with headaches and psychiatric distress. Because climate change affects everyone, the potential audience for advanced features is vast. Wearable devices that address these broader health impacts can appeal to a wider demographic, from fitness enthusiasts to individuals with chronic conditions and from those concerned about mental health to people suffering from allergies.

This expanded scope not only enhances smart wearables' value proposition but also positions them as essential tools for managing health in an increasingly unpredictable environment.

Popular wearable products (Source: Forbes)	Garmin Venu 3	Fitbit Charge 6	Apple Watch Series 9	Amazfit Bip 3 Pro	Garmin Forerunner 265	Garmin Lily 2	Samsung Galaxy Watch 6
Marketed features							
Heart rate monitoring	✅	✅	✅	✅	✅	✅	✅
SPO2 levels	✅	✅	✅	✅	✅	✅	✅
Sleep tracking	✅	✅	✅	✅	✅	✅	✅

Although these "marketed features" are shaped by the climate and environment consumers experience, they lack the innovation needed to truly meet evolving consumer demands.

Personalized climate aware features (Ambee recommendations)							
Clean routing (pollution free navigation for runs, jogs, walks, treks, etc.)	❌	❌	❌	❌	❌	❌	❌
Fitness activity Environment (is your env. suitable for fitness activity?)	❌	❌	❌	❌	❌	❌	❌
Environmental impact	❌	❌	❌	❌	❌	❌	❌
Sleep monitoring	❌	❌	❌	❌	❌	❌	❌
Hyrdation	❌	❌	❌	❌	❌	❌	❌

Fig 5: Smart wearables marked features & climate innovation perspective.

While many wearable products currently emphasize features like heart monitoring, SpO2 levels, and sleep tracking, they frequently neglect the profound influence of climate and environmental factors on these health metrics. Addressing this gap offers a significant opportunity for differentiation and securing a first-mover advantage in the market. Integrating climate and environmental insights not only distinguishes products in a competitive market but also appeals to a wider audience, thereby enriching the overall value proposition of smart wearables.

As the focus shifts towards personalized climate insights, the next frontier of wearable innovation lies in developing personalized climate-integrated features that cater specifically to individual health needs and environmental conditions. Recognizing these environmental impacts and integrating climate datasets into smart wearables enhances user-friendliness by acknowledging user empathy. This not only elevates the user experience but also positions your brand at the forefront of the wearable industry, making it future-ready with next-level personalization.

The future of wearables: Personalized climate-integrated features

Wearables have seen significant advancements over time, yet there is a pressing need for further evolution. The reasons for this imperative are as follows:

Consumers are willing to track health metrics to improve their well-being

Many consumers surveyed track health metrics and nutrition with wearable devices and appeard willing to share that data to improve their wellbeing

Capturing data

57%

of consumer have a smartwatch or fitness tracker in their household

87%

of wearable owners track health metrics with their device

39%

of wearable owners monitor calories/ nutrition with their device

Sharing data

47%

of wearable owners share data with health care providers

42%

of consumers are willing to share health data with their grocer for personalized food recommendations

Fig 6. Deloitte connectivity and mobile trends, survey 2022

Millennials and Gen Z are spending more on health and wellness-related products

US health and wellness purchases, by product/service type and generation   ■ GenZ ■ Millennials ■ Overall average

% of respondents (n = 2007)

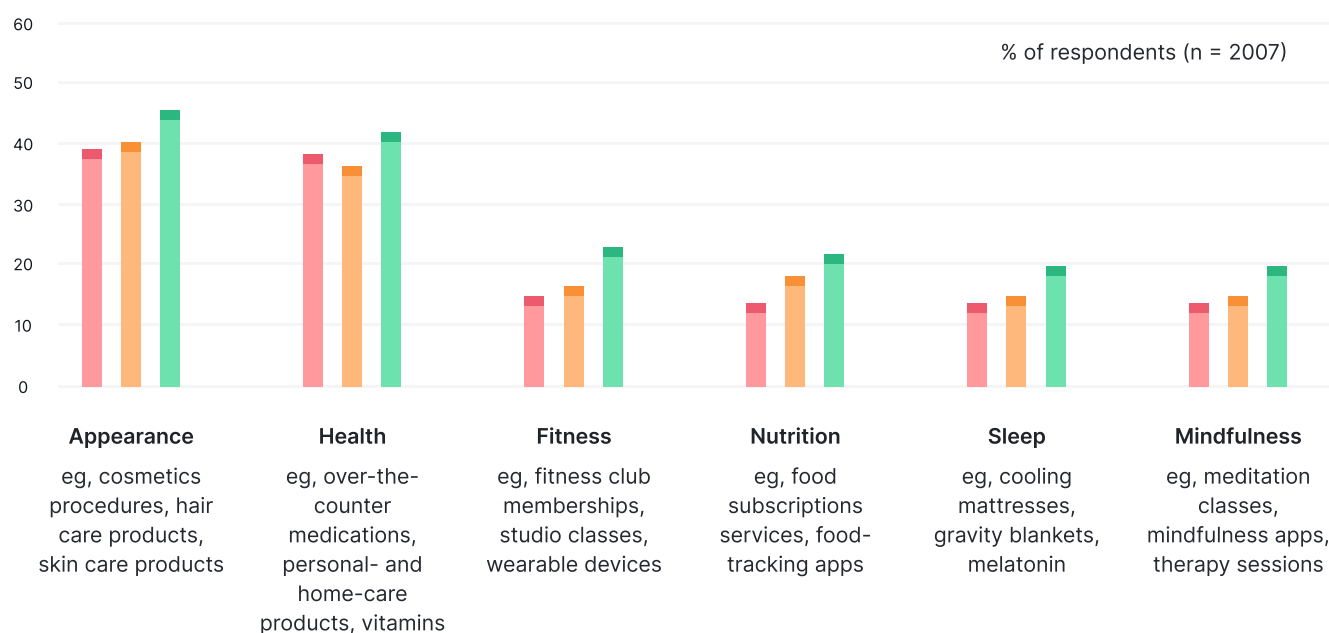|	Appearance	Health	Fitness	Nutrition	Sleep	Mindfulness
eg	cosmetics procedures, hair care products, skin care products	over-the-counter medications, personal- and home-care products, vitamins	fitness club memberships, studio classes, wearable devices	food subscriptions services, food-tracking apps	cooling mattresses, gravity blankets, melatonin	meditation classes, mindfulness apps, therapy sessions

Fig 7: McKinsey & Company

One of the primary drivers of innovation is the growing consumer demand for personalized health and wellness experiences i.e. user empathy is rapidly transforming the industry. Consumers seek devices that go beyond mere metric tracking, offering tailored recommendations and actionable insights.

While all marketed features (see Fig. 5) by smart wearables brands are influenced by climate change and the environment in which consumers reside, the key to the next stage of wearable innovation lies in personalization through climate-integrated features – necessitating leveraging climate data at a foundational level.

How smart wearables can personalize using climate datasets

1.Route with the cleanest air

(run, jog, walk, hike, trek, cycle, bike)

The smart navigation features with the cleanest route (pollen and pollution data) provide users with insights to find routes with the cleanest air in real-time and forecast.

Route suggestions	Based on real-time AQI, pollen, and weather, suggest optimal routes for running, jogging, walking, and outdoor activities.
Alerts & notifications	Receive pollution and storm alerts with alternative route recommendations.
Health monitoring	Adjust activity recommendations using health data and environmental conditions for optimal performance and health.

How Ambee helped Sanofi create the world's first navigation tool for allergy sufferers.

Ambee and Sanofi launched Allegra Airways to tackle global allergies and pollution using Ambee's real-time environmental data.

The platform empowers users with insights on pollen and pollution concentrations, offering an interactive tool and route planner based on air quality and pollen levels.

Early results show exceeding media benchmarks and strong social media engagement, underscoring the partnership's impact on healthcare and environmental innovation.

Read the full insight→

sanofi

1. Manage environmental impact on health

(heart rate, SPO2 levels, anxiety, stress)

Wellness tracking offers vast innovation opportunities, and insights into the impact of the environment on health are one of them.

Heart rate insights	Track how climate impacts an individual's heart rate in the environment they are in.
SPO2 levels	Monitor how air quality impacts blood oxygen levels.
Anxiety & stress	Inform how weather conditions influence anxiety and stress levels

Read More: Smart Wearables Can Now Track Pollutants And Allergens

2. Fitness activity environment

(based on AQ, pollen, UV, heat, and cold stress levels)

Continuously monitor environmental factors to maintain and ensure optimal conditions for physical activities, promoting safety and enhancing performance.

Optimal conditions	Monitor the environment to prevent heat & pollution-related illness due to environmental factors.
Environment alerts	Alert users to postpone or relocate activities if AQI, pollen, or other environmental factors exceed safe levels.

Read More: Here's How Air Quality Data Can Boost Your Fitness App's Performance

3. Climate-based hydration alerts

(based on heat, temp., humidity)

Climate-based hydration alerts are a crucial feature in smart wearables, alerts can proactively notify users of potential dehydration dangers and offer tailored hydration recommendations.

Dehydration risks	Analyze climate data and user inputs to detect dehydration risks and send alerts for preventive measures.
Hydration tracking integration	Combine climate data with daily fluid intake to provide real-time feedback on hydration goals.
Climate based reminders	Set automated reminders based on dehydration risk due to increasing temperature and humidity.

4. Climate and sleep connection

(env. impacting sleep cycle)

The connection between climate and sleep involves assessing how environmental factors impact sleep cycles.

Psychological impacts assessment	Climate change anxiety disrupts sleep patterns, even without direct exposure to extreme weather.
Long-term sleep trend analysis	Identify trends and correlations between environmental factors and sleep quality.
Climate exposure management for sleep	Natural light exposure during the day to assess circadian rhythms.

Driving business impact through climate data integration in wearables

As the integration of climate data drives innovation in smart wearables, it will also unlock significant opportunities for business revenue and growth.

Business benefits of integrating climate data to provide climate insights

Data-driven insights	**Product improvement** – Analyzing how users interact with wearables in different environmental conditions, provides insights into user preferences and pain points. **Behavioral analysis** – Detailed analysis of user data allows you to understand individual behavior patterns and provide personalized advice through predictive capabilities, enhancing user satisfaction and loyalty.
Environment alerts	**Market differentiation** – Differentiated products attract more attention and appeal to a niche market segment interested in comprehensive health solutions. **Improved user experience** – Increased user engagement leads to higher satisfaction and more frequent use of the device.

Demand & consumer experience	• **Growing awareness** - Users gain valuable insights into how different environmental factors, like air quality or temperature, affect their well-being. This education helps them make informed decisions about their lifestyle and health, leading to a more empowered and engaged user base. • **Catering health-conscious demand** - Wearables that integrate climate data educate users on the importance of environmental health factors, leading to increased demand from consumers who prioritize proactive health management.
Health & safety positioning	• **Proactive health management capabilities** - Appeal to a growing demographic that prioritizes preventive healthcare and relies on wearables for early warnings and preventive measures against climate-related health risks, such as heatwaves and poor air quality. • **Chronic condition support & advancement** - enhances the wearable's value proposition by positioning it as an essential tool for improving health outcomes and quality of life for chronic disease patients.
Competitive advantage	• **Perceived value** – Offering advanced climate-integrated wearables enhances the perceived value of the product, leading to a stronger brand reputation and customer trust. • **Increased market penetration** – The ability to offer more comprehensive health monitoring can attract customers who are looking for solutions that cater to specific health concerns.

Partnerships & collaborations	• **Strategic alliance** – Climate–integrated wearables can attract partnerships with various stakeholders, including healthcare providers, environmental organizations, government, and technology companies. • **Healthcare and medical wearables integration** – Partnerships enable seamless data sharing and integration between wearable devices and existing health platforms or Electronic Medical Records (EMRs).
Revenue opportunities	• **Data monetization and value-added services** – Generate recurring revenue streams through monetized value-added services that users love to pay for, improving retention opportunities and recurring revenues. • **Subscription & premium** – Grant users access to detailed environmental data reports, historical trends, and personalized health recommendations based on climate insights to build advanced options in subscription models.

But all these business benefits & impacts are market-conscious of timing when it comes to adding profit pools for smart wearable companies.

Leading the charge in climate data integration for wearables

Timing for integrating climate-related datasets into smart wearables is crucial. The growing severity of climate change, coupled with increasing competition and consumer demand, highlights the need for rapid and effective innovation to provide the best solutions for users.

Macro trends	Climate condition	Consumer demand	Competition	Future proofing
There is **growing awareness of climate change and a rising demand for technologies** that help mitigate its impact. Wearables offering climate-related insights can align with this trend, positioning a company as a leader in both health and environment technology.	As climate change accelerates, real-time data on environmental conditions becomes increasingly important. Wearbles providing these **insights will become essential tools for user navigating challenges posed by extreme weather and poor air quality.**	Climate related health risks increase, **consumers started looking for products that help them stay safe and healthy.** Wearables integrating climate data can meet this demand, offering significant value and fostering customer loyalty.	The smart wearables market is highly competitive, with new brands and products constantly emerging. Quickly introducing **climate-related features allows companies to stand out and secure a larger market share** before others catch up.	Investing in climate-related innovations in wearables prepares companies for the future differentiation in advance. As climate conditions worsen, **wearables addresing these issues will offer long-term benefits and remain relevant to consumers' needs.**

Fig 8: Timing matters in innovation for smart wearables

While the reliability of timing is a crucial factor, the credibility of climate data is also a major concern to address before integrating climate datasets to provide climate insights to smart wearable users.

Harnessing credible climate data for growth in the wearable market

Predicting how the body responds to climate through climate-integrated smart wearables like smartwatches, fitness trackers, and medical wearables requires real-time, forecasted, and historical climate data to provide insights. This level of insight isn't possible without data you can trust. While the timing of data delivery is crucial for immediate decision-making, the credibility of that data is equally paramount. It ensures that the insights and recommendations provided by wearables are not only accurate but also actionable, empowering users to make informed choices about their health and well-being.

Monitoring air quality levels, predicting pollen outbreaks, and assessing heat-related risks are critical functionalities where the credibility of information directly affects how effectively smart wearables can enhance personal health management. By prioritizing data reliability, manufacturers not only drive groundbreaking innovations but also strengthen their leadership position in the wearable technology industry.
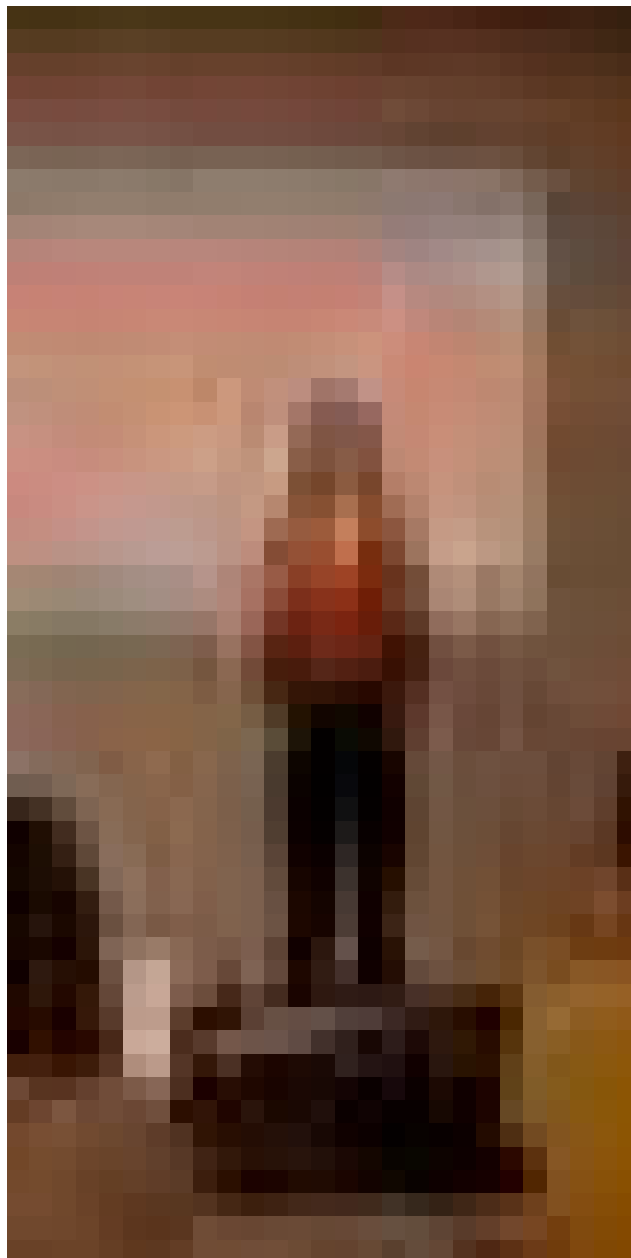
Key takeaways

In the smart wearables industry, health and wellness have become the battleground for innovation, driven by advancements in data and intelligence. However, while the industry focuses on enhancing health and wellness capabilities, it often overlooks the significant role of climate and environmental factors in individual health. Innovation in smart wearables is typically linked with technological advancements, where consumer adoption drives progress. Yet, demographic and psychographic factors, such as increasing awareness of personal health and well-being, fuel innovation across the smart wearables value chain.

This whitepaper explores whether climate-sensitive consumers are truly benefiting from their wearables, the health impacts of climate change, and the necessity for reliable climate data to timely adapt offerings. By harnessing dependable data, smart wearables can continually innovate, offering advanced features that optimize performance and health amid changing climate conditions.

By leveraging reliable data, smart wearables can continuously innovate to deliver advanced features that optimize performance and health in changing climate conditions. Talk to us about building smart wearables next climate solution.

To learn more about integrating climate data with wearable devices, you can contact our experts at contactus@getambee.com or schedule a call with them.

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