For Immediate Release:

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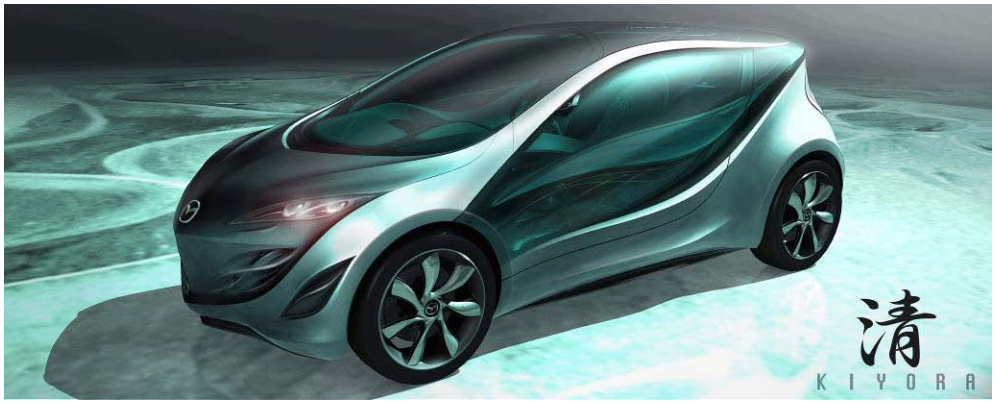
# MAZDA KIYORA CONCEPT CAR

## THE ECO-FRIENDLY CITY CAR

**Paris Motor Show (Mondial de l'Automobile 2008)**: Last year Mazda revealed the direction its new technology development would take when it announced the Sustainable Zoom-Zoom plan. Sustainable Zoom-Zoom articulates the role that Mazda should play in addressing the global issues we face with respect to the environment and safety and outlines Mazda's efforts toward achieving a future sustainable environment. In line with this plan, Mazda is focused on making cars that achieve harmony between Mazda's hallmark driving pleasure and environmental and safety performance.



Specifically, Mazda aims to improve the average fuel economy of Mazda vehicles sold globally 30% by 2015 over 2008 levels. We will focus on thorough improvements in internal combustion engine vehicles and solid progress and evolution toward the realization of future solutions. First of all, our efforts will focus on improving fuel economy in our internal combustion gasoline and diesel engines.

Efforts in weight reduction, the imminent launch of Mazda's unique Smart Idle-Stop System (SISS) and direct injection engines from 2009 onwards, and clean diesel engine, will see all Mazda vehicles with reduced CO2 emission levels. Furthermore, from 2011 onwards, Mazda will renew almost its entire powertrain lineup, including both gasoline and diesel engines and transmissions, to improve fuel efficiency by 20 percent across the engine range.

Also from 2011, through steadily developing safe, lightweight, new generation platforms, Mazda aims to reduce the weight of its new vehicles by 100 kilograms or more. This will not simply be through the use of new materials. Rather, it will be a combination of new materials, production methods and well optimized architectures. Through these activities we hope to enhance production, quality and vehicle performance.

Mazda Kiyora demonstrates how Mazda will achieve the targeted 30 percent improvement in fuel economy while still introducing new vehicles that

are exciting to look at and drive. Featuring next generation environmental technologies, Kiyora was envisaged as a fun and cool concept for young European urbanites, and one that only Mazda could produce.

Mazda Kiyora gives an indication where Mazda could go with a small, eco-friendly city car in the near future. It is highly fuel efficient, with a very small CO2 footprint, delivering Zoom-Zoom driving fun and high levels of safety. The car achieves this by taking Mazda's acclaimed lightweight strategy to a new level by employing an extremely rigid and lightweight carbon-fibre body structure beneath a small, aerodynamic outer skin and a spirited, small-displacement 1.3-liter direct injection engine. Mazda Kiyora would also feature Mazda's unique Smart Idle Stop System and a newly developed six-speed automatic transmission. The transmission has a direct feel and will achieve fuel efficiency similar to that of a manual transmission, with CO2 emissions under 90g/km.

Themes for the Mazda Kiyora concept include cleanliness, health and safety. These key aspects are essential for young city dwellers as well as any compact car in the current global environment. The concept was based on Mazda's sustainable technology vision, which aims to ensure customers can continue to enjoy a Zoom-Zoom experience in the future. Water was also selected as a theme for this concept, due to its association with the aspects mentioned above, and the car was named Kiyora (meaning 'clean and pure'

in Japanese) to reflect this. It features next-generation technologies clothed in a friendly and cool design that is as functional as it is beautiful. This is the first concept to express Nagare ‘flow’ in the patterns and colours of water.

**Defining the Concept, “Urban HUB” – Advanced Product Strategy**

Mazda Kiyora is a redefinition of the small Coupe and is dedicated to embody the same fun-to-drive nature as every other Mazda vehicle, combined with innovative ideas that minimize its impact on the environment. This concept is the translation of Mazda’s ‘Sustainable Zoom-Zoom’ philosophy into a lifestyle vehicle for progressive urbanites.

The idea for this car was born from research which identified market opportunities to address future unmet customer needs with innovative concepts and ideas. The very first step taken by Mazda Motor Europe’s Advanced Product Strategy (APS) team was an in-depth analysis of the small city car segment in Europe. Having defined several potential customer profiles in this segment, the team focussed on the urban customer with a post-modern lifestyle.

APS found that exterior styling, compact size, manoeuvrability and flexibility were just as important to these young people as high fuel efficiency. European urbanites, then, will continue to commute and use their cars in the city of the future; but they will expect them to use less fuel and produce fewer

toxic emissions, while still being fun to drive, easy to park and use. To achieve this, the vehicle must be lightweight and small. Kiyora is even smaller than the new Mazda2. Reducing vehicle weight is a key concept that is crucial to achieve the goals set out in the Sustainable Zoom-Zoom plan. Kiyora takes Mazda's 'gram strategy' — that has been used previously to produce new vehicles, all of them lighter and more fuel efficient than their predecessors — to the next level. It should also be flexible, a kind of 'urban HUB' that would allow you to go to university during the day, go shopping in the early evening, and take three friends clubbing at night before driving home, thanks to its flexible storage space (2-seater + trunk) and/or additional seating (2+2 seater). The car should have a next-generation cockpit and be fun to use on a daily basis. In fact, Mazda Kiyora takes the concept one step further by being safe and environmentally friendly.

**Zoom-Zoom experience and environmental performance**

Mazda Kiyora supports the active lifestyles of young people with its agility, cleanliness, and excellent economic performance. Mazda's next generation 1.3-litre DISI[1] petrol engine is an evolution of technologies used for the 2.3-liter DISI petrol engine that currently powers Mazda's sports crossover SUV, the CX-7. Improved direct injection technology and newly

[1] * DISI = direct injection spark ignition

designed combustion chambers enable more precise ignition control. The engine's efficiency is increased by a combination of advanced dual sequential valve timing (S-VT), variable valve timing and lift mechanism, and optimal valve control. The engine is spirited as well as clean and efficient and, in combination with a compact and lightweight six-speed automatic transmission with manual shift control, it would make Mazda Kiyora powerful and cultivated, even at low engine speeds. In stop and go urban traffic conditions, Mazda's newly developed Smart Idle Stop System (SISS) would come into its own. Mazda's SISS saves fuel by automatically shutting down the engine when the vehicle is stationary, and achieves a quick and quiet restart for stress free driving. The system injects a small amount of fuel directly into the engine's cylinders and ignites it to generate downward piston force which, with the aid of an electric motor, rapidly returns the engine to idle speed. Emissions would be among the lowest thanks to a new catalyst that more effectively removes harmful exhaust materials by employing single-nanotechnology to control catalyst particles that are smaller even than those controlled by conventional nanotechnology. Combined with reduced weight and improved aerodynamics, these insightful technologies would result in CO2 emissions of 90g/km or less.

**Exterior – Fusing Form with Function**

*"Mazda Design has been working hard over the past two years to develop an exciting new design message with its Nagare series,"* says Peter Birtwhistle, Chief Designer, Mazda Motor Europe. *"Mazda Kiyora is the latest iteration of that philosophy."*

The Mazda Kiyora concept car is formed in the shape of a water droplet on its side, as are its two side windows. Its diminutive size and low roofline give it a small front cross-section. This is combined with an elaborate underbody that controls wind swirl, a rear roof spoiler, and specially sculptured body lines for a highly aerodynamic form with a coefficient of drag that is over 10 percent lower that of the current Mazda2. This outstanding fusion of engineering and the Nagare design was a key target.

*"The architecture of the car has been rethought,"* says the concept's lead exterior designer, Mickael Loyer. *"The main structure of the car is an 'in and out' frame, like a shell that protects you from the outside environment, and lets you be opened and linked to it at the same time, thanks to the transparency of the top and the side windows, which also gives a lightweight feeling."*

About 10 cm shorter than the new Mazda2 sub-compact, Kiyora is also an environmentally friendly city car that is cute and agile, and invites you to climb in for a ride. It uses a soft design language and flowing lines, while

retaining an overall style that is really expressive and sporty. Here is the expressive five-point grille first used on the Mazda Sassou concept three years ago – backlit when the car is on with soft, red lighting – but now further developed with Nagare flow lines that are carved and more three-dimensional. They are formed to guide air into the interior of the car without the use of fans, which saves weight. Its silhouette features character lines that are sleek and smooth, and move upwards and rearwards, fusing into the rear spoiler. Combine it all with 18-inch alloys and extremely small overhangs, and you have a truly sporty look in a small package.

Though small, Mazda Kiyora has a rear trunk big enough to carry a large suitcase, a briefcase and a notebook. It is accessible via a liftgate that opens very high (with a low load floor level) for easy loading and unloading, and it’s flexible. When the rear seats are not in use, you can push your luggage forward and stow even more, while the strong yet flexible seat material stretched over the seats holds the luggage in place. This system also has the advantage that it hides whatever is stored in the trunk from prying eyes outside the car.

The roof of the new Mazda Kiyora is another example of how Mazda designers were able to combine functionality and design aesthetics. It is transparent, for an open-air feeling on the inside and has photovoltaic solar cells which provide electricity for the car’s interior systems.

*“Kiyora is about water fluidity and transparency,”* says Mr. Loyer. *“It’s all about layers of perception. You start with a shape and there is a shape behind and another one behind that. It’s like water; the deeper you go the more details appear. Nagare flow here has different layers flowing into each other. Repeated layers lead you into the car. And because the inside of the car is visible, it becomes part of the exterior design.”*

The doors and side windows of Mazda Kiyora are fused into a single unit and function as both. These ‘windoors’ are made of plastic, which provides the same transparency and refraction properties as glass, and the strength of a thin-panel door, but with far less weight. They are also easy to use and practical. Touching the surface of the front tip of the door activates a sensor, which opens the doors up and away from the car, a plus when parking in tight city spaces. They also allow a view into the interior when the doors are closed. But looking into Mazda Kiyora is more than just looking through glass.

*“Using various layers of materials, combined with forms and colours on the inside, gives the impression of looking into water with its depths and flowing shapes below the surface,”* says Luca Zollino, who assisted Mr. Loyer in creating the exterior*. “For instance, there is a body shell side member shaped like sea grass that is visible just behind the surface of the doors and,*

*when you look deeper into the car, there are the flowing shapes of the dashboard and centre console."*

The design of the wheels also supports the water theme. Its front spokes are convex and shaped like the blades of a boat propeller, while the concave back spokes are joined to the wheel rim and have a reinforcement that seems to grow out of the spoke itself. Kept very smooth, the wheels of Mazda Kiyora give a twirling, twisting surface articulation.

**Interior Design –Visualised 'Nagare' design and an expression of lightness**

The interior shapes not only provide aesthetic motifs, they also function to stiffen the passenger compartment with minimal weight. Mazda's strategy of shedding excess grams wherever possible in its production cars was taken to a new level in Mazda Kiyora. The visible body structure is a real structural element of the car – stiff and crash-resistant. It is indicative of Mazda's approach to conduct a thorough structural analysis to solve complex issues such as safety and rigidity requirements instead of simply replacing materials with more expensive ones. The rear seats that are integrated into the body framework are also examples of this approach. Lightweight materials such as aluminum and a special resin foam, which is under development at Mazda, are used not only for interior parts such as the

instrument panel, but also for the hood, tailgate and sections of the chassis. Their effective usage contributes to improving the yaw moment of inertia and reducing the unsprung mass, and leads to superb handling.

The Mazda Kiyora has interior shapes that express Nagare ‘flow’ by looking as though they are floating in a current of sea water that is moving from front to back. The instrument panel starts at a single point and flows around the driver and to the right of the front passenger as if it were several blades of sea grass growing out of a rock underwater. The front seats seem to float above the floor, and the arms of body structure twist like sea weed at the sides and top of the cabin. As well as being an integral design element, the door structure also functions as a side member and, in combination with the side sills, would effectively protect occupants in the event of a side impact.

*“Rapid prototyping was used for most of the natural shapes,”* says Jo Stenuit, Assistant Chief Designer and Project Leader. *“We have a very natural design with complex flowing shapes. Normal moulding processes would not have allowed us to produce such elaborate designs.”*

**New Liquid-Skin Display IP Concept**

This display would be a simple yet very practical type of instrument panel that uses advanced touch-screen technology with tactile feedback.

Using liquid-skin display technology, it would mimic the rippling that water makes when you touch it with your finger. When the car is off, the IP looks like ice, frozen and hard. When the car is switched on, the display appears to turn into water. Information icons would appear and float downwards to pre-programmed positions in front of the driver. The driver would be able to move the icons around with his finger and could even organise them however he wished. He could flip through menus, select settings for temperature, and even send an email.

*"We call Kiyora's IP a liquid-skin display," s*aid Gregory Vera, who designed the interior, *"because it is conceived to ripple like water when you touch it. Icons bounce off each other as if they are floating in water. This would be a logical next step in intuitive-feedback, flexible-screen displays and is a natural and easy way to operate the systems of a car."*

From this touch-screen display, you could also control a hard-disk drive with advanced sensors that would provide environmental information like how much fuel you used and how many grams of CO2 you released into the atmosphere on a particular day. It could also calculate how many toxins the car filtered out of the air and water during the same period.

**Considerations for the cabin environment**

Mazda Kiyora would be able to filter out toxins from the outside air and use it inside the car. The right side of the dashboard consists of a large, single piece of thick activated carbon, which is a natural resource that has been used for centuries in Asia as a purifying material. The above-mentioned Nagare flow lines at the front of the car guide outside air into the car and through this charcoal, which filters out and captures toxins better than most filter systems without the need for an electric fan or inorganic materials.

Taking advantage of rain as a natural resource the roof of the Mazda Kiyora channels rainwater firstly through an activated carbon filter and then into a specially commissioned drinks bottle designed for Mazda by LIFESAVER® systems. The LIFESAVER® bottle citi™ is located between the front seats for easy access, and uses state of the art ultra filtration hollow fibre membranes. With a pore size of 15 nano-meters these membranes remove microbiological contamination including bacteria and viruses without the aid of chemicals, delivering safe fresh drinking water to the user any time. The bottle is removable so can be taken out of the car and used to gather water from other natural sources such as rivers, lakes and streams.

**Colours and Materials – A Triumph of Material Engineering**

Mazda Motor Europe's Colours + Materials team has distinguished itself in the development of new kinds of materials for its concepts. In Sassou, it was translucent plastic treated in a way to match the body colour and to hide light effects, and in Hakaze it was the brilliant use of surface textures that mimic the feel of natural materials. With the Mazda Kiyora, the colours and materials team faced its greatest challenge yet – to express the theme of 'pure water' in visible and touchable ways.

*"Based on the extreme requirements of Kiyora, as a new eco-friendly car with a fully flexible interior, we needed to research in unusual fields,"* said Maria Greger, Senior Designer at Mazda Motor Europe and head of the Colours + Materials team. *"We looked for materials and processes that are not yet used in the automotive industry. We had to find materials that not only work in covering parts, but are directly related to function. The best example is the material used for the floor and rear seats. This is the same textile, but treated differently to best adapt to the function it needs to fulfil."*

The exterior of the Mazda Kiyora is blue-green and has transparent, polycarbonate doors, chosen to underscore the purity of water. On the inside you can see forms – like the wavy side member of the body structure – that look like flowing sea grass. These were given a colour scheme that, when

seen through the doors from outside the car, makes it seem as though you are looking into water.

*“We chose bluish and greenish colours, which is colour of water,”* said Luciana Silvares, Senior Designer at Mazda Motor Europe. *“The deeper you go, the deeper the colour of water gets. We wanted to give this car the feeling of water and ice, sea or lake (from the surface to depth), showing transparency and gradient.”*

The interior is a masterpiece of materials engineering. The body shell is visible, like an inner skeleton, and supports the water theme with its wavy, flowing shapes, while functioning as a true body structure. And the interior has a colour scheme that makes the front seats seem to float above a floor that looks like frozen water. For the instrument panel and door inners, soft coatings and light metallic effects are employed to enhance this impression.

The rear seats are one of the concept’s most interesting features and a perfect example of how to combine material and design to express the theme of water, while saving weight and losing nothing in functionality. They are made of only two components: a seat skeleton that is part of the body structure at the back of the cabin, and a flexible and robust textile stretched over this. This textile allows a person to sit down into the seat and acts as a firm surface to sit on like a lawn chair, and then to spring back to its original shape when the person leaves the car – effectively hiding the seats. This

‘hidden seat’ is only for short trips in town, and is far lighter than traditional car seats.

*“The material for the rear seats is an extremely stretchable textile that we developed with the Company Straehle und Hess,”* said Ms. Greger. *“It is made of knitted polyester that has the ability to return to its original shape. With a special construction of two laminated layers, this material is, despite its extreme stretch ability, also extremely stable.”*

The rear seats also had work in conjunction with the floor to contribute colour-wise to the overall theme of pure, watery depths. Both the seats and the floor are made of the same materials, but treated differently to maximise their functionality. Two-dimensional printing was employed for the colours and sea grass graphics on the seats, and a unique, three-dimensional (3D) casting process was used for the floor surfaces. The 3D casting process was inspired by the PU micro-injection printing process used on textiles for sportswear. This allowed the team to give the floor surface the durability and abrasion strength needed to function as a real floor, and to create the image of deep and layered surface to express the image of water and ice.

**Mazda Kiyora Concept Car – Specifications**

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| Body type | | Three-door hatchback |
| Dimensions | Overall length | 3,770 mm |
| | Overall width | 1,685 mm |
| | Overall height | 1,350 mm |
| | Wheelbase | 2,495 mm |
| | Seating | 2 +2 |
| Engine | Type | Next Generation MZR 1.3-litre DISI* petrol<br>With smart idle stop system |
| Transmission | Type | Next-generation 6-speed AT with manual shift |
| Suspension (Front/Rear) | Type | MacPherson Strut/Torsion Beam |
| Tires | Type | 215/45 R18 |

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