The Technocene Covenant

Cyber Ecology, Rewilding, and Eschatological Participation in the Renewal of Creation

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Abstract

The ecological crisis is unfolding within a world increasingly shaped by artificial intelligence, autonomous machines, digital monitoring, and planetary technological systems. Christian environmental thought has often responded through the language of stewardship. Although stewardship has encouraged responsibility toward the natural world, it can still place humanity at the centre as the permanent manager of creation. This article proposes a different framework. It introduces the Technocene covenant as a theological model for understanding carefully limited technology as a means of ecological repair, restraint, and participation in the renewal of creation.

The focus is automated rewilding. Artificial intelligence, environmental sensors, autonomous seed dispersal, robotic restoration, and satellite observation may help damaged ecosystems recover without requiring constant human control. Technology is therefore not treated as inherently opposed to nature. Its moral value depends on whether it extends domination or creates conditions in which ecological life can regain its own patterns, relationships, and independence.

Creation theology provides the basis for viewing human creativity as part of material existence rather than as a force standing outside it. Eschatology gives the proposal its future direction. Ecological repair cannot create the final renewal promised by Christian faith, but it may offer a present sign of that future. Such action is proleptic because it allows the hope of restored creation to influence present responsibilities. The Technocene covenant therefore describes a disciplined relationship among technological ability, ecological restraint, and Christian hope. It calls humanity to use advanced tools not to replace creation, but to reduce destructive interference and help the living world recover.

Keywords

Technocene, cyber-ecology, automated rewilding, creation theology, eschatology, artificial intelligence, ecological restoration, biocentrism, technological restraint

Introduction

The ecological crisis is no longer separate from technological development. Forests are observed through satellites. Wildlife movements are tracked through digital sensors. Artificial intelligence is used to detect fire, analyse habitat loss, identify species, and predict environmental change. Autonomous machines can plant seeds, remove invasive organisms, collect ocean waste, and enter damaged environments that may be difficult or dangerous for human workers. Technology has become part of the way ecological damage is caused, measured, understood, and sometimes repaired.

This condition may be described as the Technocene. The term refers to an age in which technological systems have become powerful forces within the physical life of the planet. Technology is no longer limited to tools held by individual human beings. It now includes networks of machines, data centres, automated systems, communication infrastructures, satellites, algorithms, and industrial processes operating across large areas and long periods of time. These systems influence land, water, climate, energy, agriculture, migration, and the survival of species.

The Technocene presents a serious theological problem. Modern technology has intensified extraction, consumption, pollution, and ecological fragmentation. It has allowed human societies to alter environments at a speed and scale that previous generations could not have imagined. Yet the same technological capacity may also be directed toward restoration. The moral question is therefore not simply whether technology is natural or artificial. It is whether technological power serves domination or recovery.

Christian environmental theology has often answered ecological destruction through the concept of stewardship. Human beings are understood as responsible caretakers who must protect what God has created.

This language has helped challenge interpretations of dominion that justify exploitation. It has also encouraged churches and Christian communities to take environmental responsibility seriously.[1]

Stewardship, however, has limits. It can continue to imagine humanity as the central manager of the natural world. Creation remains something that people supervise, organise, improve, and direct. Even when stewardship is gentle, it may preserve the assumption that ecological systems require permanent human authority.[2]

Rewilding offers a different approach. Its purpose is not to manage every part of an ecosystem. It seeks to restore the conditions in which natural processes can function with less human control. Habitats are reconnected. Native species are allowed to return. Rivers regain movement. Forests develop without constant cultivation. Predators, prey, plants, soil, water, and climate resume relationships that human activity has interrupted.[3]

Rewilding does not mean abandoning every damaged landscape and expecting immediate recovery. Some environments have been altered so severely that careful intervention is necessary. Polluted soil may require treatment. Invasive species may need to be removed. Fragmented habitats may need to be connected. Endangered populations may need temporary protection. Yet the aim is not permanent management. The aim is to help ecological systems recover enough strength to continue without constant human direction.

This is where cyber-ecology becomes important. Cyber ecology may be understood as the use of digital and automated technologies to observe, protect, and assist ecological systems while reducing intrusive human presence. Artificial intelligence can interpret large amounts of environmental information. Sensors can detect changes in soil, water, temperature, sound, and animal movement. Drones can distribute native seeds across damaged land. Robotic systems may remove pollutants or invasive organisms. Satellite images can reveal deforestation, habitat fragmentation, illegal extraction, and changes in vegetation.

These tools can easily become instruments of control. A forest reduced to data may be treated as a resource to optimise. Wildlife tracking may become a form of surveillance serving commercial interests. Automated restoration may allow governments or companies to continue destructive practices while promising that technology will repair the damage later. The presence of advanced machinery does not make an ecological project responsible.

The theological value of cyber-ecology therefore depends on restraint. Technology should not be used to redesign creation according to human preference. It should serve the recovery of ecological life beyond human convenience. Its purpose is not to make nature more productive, predictable, or profitable. Its purpose is to identify damage, assist repair where necessary, and then withdraw.

This principle separates cyber ecology from technological mastery. Mastery seeks greater control. Cyber ecology, as developed here, seeks to make control less necessary. Its success is not measured by the permanent presence of machines. It is measured by the return of ecological independence.

Creation theology supports this approach because it affirms that the world possesses value beyond its immediate usefulness to humanity. The earth is not merely a background for human history. Animals, plants, waters, soils, and landscapes belong to a created order that has meaning before God. Human beings hold a distinctive place within creation, but distinction does not justify absolute control.[4]

Human creativity also belongs within creation. Technology does not come from a realm outside the natural world. It emerges through human minds, bodies, materials, communities, and histories. The fact that a tool

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3Willis Jenkins, Ecologies of Grace: Environmental Ethics and Christian Theology (Oxford: Oxford University Press, 2008).

4Norman Wirzba, "Humanity's Place in Creation," in The Paradise of God: Renewing Religion in an Ecological Age (New York: Oxford University Press, 2003), 123–48.

is artificial does not automatically make it hostile to creation. A tool becomes harmful when its purpose and consequences violate the life around it.[5]

This means artificial intelligence and automation should not be rejected simply because they are technologically advanced. They must be judged by the relationships they create. Do they increase extraction? Do they deepen dependence? Do they centralise power? Do they replace living systems? Or do they reduce harm, support recovery, and allow ecological processes to continue with greater freedom?

Eschatology gives this discussion a further dimension. Christian hope does not end with the escape of human souls from the material world. It includes the renewal of creation. The New Testament presents creation as suffering, waiting, and sharing in the hope of liberation. The future of salvation therefore concerns the whole created order.[6]

Human beings cannot produce this final renewal. No ecological project, political system, or technological invention can create the eschaton. The renewal of all things remains the work of God. Yet Christian hope is not passive. The promised future shapes conduct in the present.

Ecological restoration may therefore be described as proleptic. It brings a limited sign of the hoped for future into present life. A restored wetland is not the new creation. A recovered forest does not complete redemption. The return of a species does not overcome every form of corruption. Yet these acts express loyalty to a future in which destruction does not have the final word.[7]

The Technocene covenant names this relationship among technology, ecological restraint, and eschatological hope. Covenant language is not used to claim a new revelation or replace biblical covenants. It describes an ethical commitment concerning how technological power should be used within creation. Humanity accepts responsibility not simply to manage the earth, but to restrain its own dominance and assist the recovery of the wider community of life.

The central claim is that automated ecological restoration can become a form of Christian participation in the healing of creation when it supports rewilding rather than control. Artificial intelligence and robotics are not ecological saviours. They are tools whose value depends on their purpose. When used with humility, accountability, and restraint, they may help humanity repair damage and step back.

The question facing the Technocene is therefore not whether machines belong in nature. Machines are already part of the planetary condition. The more important question is whether they will extend human domination or help create the conditions for ecological freedom.

Deconstructing the Divide Between Machine and Nature

The conflict between technology and nature is often presented as self evident. Nature is imagined as organic, living, and authentic. Technology is imagined as artificial, mechanical, and disruptive. This contrast is emotionally powerful, but it is not always intellectually reliable.

Human beings have always altered their surroundings through tools. Stone blades, irrigation channels, roads, boats, mills, printing presses, and electrical systems all changed the relationship between people and the environment. The difference in the present is not that humanity has suddenly become technological. The difference is the scale, speed, and complexity of technological power.

Modern systems can alter entire regions without direct physical contact. An algorithm can influence agricultural production across continents. Satellite data can guide mining, forestry, military action, or conservation. Automated systems can make decisions faster than human communities can evaluate their

5Paul R. Jepson, "De-extinction beyond Species: Restoring Ecosystem Functionality through Large Herbivore Rewilding," Cambridge Prisms: Extinction 3 (2025): e3.

6David Fergusson, Creation (Grand Rapids, MI: William B. Eerdmans, 2014).

7Norman Wirzba, The Paradise of God: Renewing Religion in an Ecological Age (New York: Oxford University Press, 2003), 1–22.

consequences. The problem therefore lies less in the existence of technology than in the purposes it serves and the forms of power it supports.

A strict division between machine and nature also overlooks the material origin of technology. Every device is made from substances drawn from the earth. Metals, minerals, water, energy, and biological labour remain present within the technological world, even when they are hidden from view. Digital systems may appear immaterial, but they depend on mines, factories, data centres, cables, transport networks, and electricity.

Technology is therefore not outside creation. It is assembled from creation through human skill. This does not make every technological practice morally acceptable. It means that artificiality alone is not enough to condemn a tool.

A machine may damage an ecosystem. It may also reduce harm within one. A drone may support illegal hunting, or it may identify animals at risk. An algorithm may increase industrial extraction, or it may detect ecological decline before visible collapse. A robot may replace human labour for profit, or it may enter a polluted area where direct human presence would cause further disturbance.

The moral question concerns orientation.

Technology becomes destructive when it treats creation as raw material for human use. It becomes more responsible when it recognises limits, supports ecological recovery, and accepts that human desires should not determine every outcome.

This is where traditional environmental language can become inadequate. The phrase technological solution often suggests that every ecological problem can be corrected through greater innovation. Such confidence is dangerous. It may encourage continued destruction by promising that future machines will repair present damage.

A forest cannot be reduced to carbon storage. A river cannot be understood only through water volume. A species cannot be treated merely as data within a model. Ecological life includes relationships that exceed human measurement.

Technological systems should therefore support ecological understanding without claiming complete knowledge. They may reveal patterns that human observers cannot easily detect, but they should not be treated as infallible. Data can be incomplete. Algorithms can reproduce human priorities. Measurements can hide what they do not include.

A responsible cyber ecological framework begins with humility. It accepts that ecosystems are complex, changing, and only partly understood. Technology may assist observation and repair, but it should not claim authority over the whole.

Technology as an Expression of Human Creativity

Creation theology allows human creativity to be understood as a gift, but not as a licence for unlimited control. Human beings create because they are thinking, embodied, social creatures. They imagine, design, build, repair, and communicate. These capacities can serve life or destroy it.

A theology of technology must therefore avoid two opposite errors.

The first is technological worship. This treats innovation as naturally good and assumes that progress will solve every crisis. It places excessive trust in human capacity and ignores the moral failures that shape technological systems.

The second is technological rejection. This treats machinery as inherently corrupt and imagines that ecological faithfulness requires a return to a world untouched by human invention.

Neither view is sufficient.

Technology is morally shaped by the communities that create it, the goals it serves, and the effects it produces. The same technical capacity can support care or exploitation. The theological task is not to bless technology in general. It is to distinguish forms of creativity that protect life from those that deepen domination.

Human creativity reflects responsibility only when it remains accountable to the wider creation. A tool cannot be judged solely by efficiency. It must also be judged by what it allows, what it damages, who controls it, and whether it can be withdrawn.

This final point is especially important. Many technologies create dependence. Once installed, they require further systems, further energy, and further intervention. Ecological restoration can then become permanently tied to technological maintenance.

A stronger model aims for decreasing dependence. Technology should help restore the conditions in which ecosystems can function with less assistance. Its highest success may be reached when the machine becomes unnecessary.

This principle changes the meaning of innovation. The most advanced ecological technology is not always the most complex. It may be the one that knows when to stop.

The Limits of Human Management

Human beings often approach damaged environments with the instinct to organise them. This can be necessary, especially where pollution, habitat loss, or invasive species have caused severe disruption. Yet ecological repair can become another form of domination when human management is treated as permanent.

The history of environmental intervention includes many cases in which attempts to control one problem created another. Species have been introduced to remove pests and later became destructive themselves. Rivers have been redirected to improve production and caused damage elsewhere. Forests have been simplified for efficiency and lost ecological resilience.

These failures do not prove that all intervention is wrong. They show that control is limited by incomplete knowledge.

Cyber ecology should therefore be guided by a cautious principle. Intervention should be sufficient to support recovery, but restrained enough to preserve ecological freedom.

This approach differs from conventional management. Management often seeks predictability. Rewilding accepts that living systems may develop in ways that human planners did not fully intend. A restored landscape may not return to a fixed historical condition. Climate, species movement, and environmental change may produce a new balance.[8]

The purpose is not to recreate an imagined perfect past. It is to restore the capacity of ecological systems to continue living, adapting, and relating.

Automation can assist this process when it is carefully limited. Sensors may indicate when soil moisture has recovered. Artificial intelligence may identify when animal populations no longer require direct protection. Robotic systems may remove pollutants until natural processes resume.

The technology should then reduce its presence.

A permanent technological occupation of the landscape would contradict the purpose of rewilding. The goal is not to replace one form of human control with a more efficient digital form. The goal is to make ecological self direction possible.

From Domination to Restraint

The machine and nature divide becomes less useful when it hides the deeper ethical question. The central issue is not whether a tool appears natural. It is whether the tool expands domination or supports restraint.

8David Fergusson, “Eschatology,” in The Cambridge Companion to Christian Doctrine, ed. Colin E. Gunton (Cambridge: Cambridge University Press, 1997), 226–44; Joseph S. O’Leary, “Eschatology,” in The Oxford Handbook of Catholic Theology, ed. Lewis Ayres and Medi Ann Volpe (Oxford: Oxford University Press, 2018), 229–46.

A wooden tool may still be used destructively. An artificial intelligence system may sometimes reduce harm. Moral value cannot be determined by appearance alone.

Restraint is not passivity. It may require significant knowledge, planning, and action. A damaged ecosystem may need careful protection before it can recover. Yet restraint places limits on intervention from the beginning.

It asks several questions.

How much intervention is necessary?

Who decides when intervention should end?

Does the technology increase ecological independence?

Can local communities understand and challenge the system?

Does the project protect nonhuman life even when there is no immediate human benefit?

These questions move the discussion away from technological enthusiasm and toward ecological responsibility.

The Technocene covenant depends on this shift. It does not celebrate machinery. It places machinery under moral limits. It recognises human creativity as valuable, but it refuses to treat creativity as ownership.

Technology serves creation when it helps repair damage without claiming permanent authority over what it repairs.

The Cyber Ecology Framework

Cyber ecology brings digital systems into ecological restoration, but it must be defined carefully. The term can easily suggest a world in which nature is governed through constant data collection and machine control. That is not the model proposed here.

Cyber ecology should be understood as the limited use of digital and automated tools to observe ecological conditions, support necessary repair, and reduce human intrusion.

Its purpose is not to turn ecosystems into programmable systems. It is to help restore the conditions in which living communities can continue beyond constant supervision.

This framework rests on five principles: attentiveness, minimal intervention, ecological autonomy, biocentric evaluation, and technological withdrawal.

Ecological Attentiveness

The first principle is attentiveness.

Ecological harm often develops before it becomes visible to ordinary observation. Changes in temperature, soil chemistry, water quality, animal movement, or plant health may begin slowly. By the time damage becomes obvious, recovery may be more difficult.

Digital tools can improve early recognition. Sensors may record changes over long periods. Acoustic systems may detect the absence of birds, insects, or amphibians. Satellite imagery may reveal forest decline, drought stress, or illegal clearing. Artificial intelligence may identify patterns across large bodies of environmental information.

Attentiveness, however, should not become total surveillance.

The collection of ecological data must remain connected to a clear restorative purpose. Data should not be gathered simply because it can be gathered. The use of digital systems should also respect local knowledge, Indigenous knowledge, and the experience of communities who have lived with particular landscapes across generations.

Artificial intelligence can assist interpretation, but it cannot replace human responsibility. It may recognise a pattern, yet it cannot determine the moral meaning of that pattern on its own.

Ecological attentiveness therefore requires technical knowledge and ethical judgment. The machine may help people see more clearly, but people remain responsible for what follows.

Minimal Intervention

The second principle is minimal intervention.

Not every ecological problem requires a large technological response. Sometimes the most effective action is to stop pollution, reduce traffic, remove barriers, end extraction, or allow land to remain undisturbed.

Technology should not be introduced merely to demonstrate innovation. Its use is justified only when it reduces greater harm or supports recovery that would otherwise be difficult.

Minimal intervention does not mean weak intervention. A severe ecological crisis may require decisive action. It means that the scale of the response should remain proportionate to the damage.

A robotic system used to remove toxic waste from a river may be justified where human labour would be dangerous or more disruptive. An automated seed dispersal system may be useful across damaged land that cannot be restored by ordinary planting. Yet such systems should serve a defined purpose and a limited period.

The machine should not become the centre of the project. The ecosystem remains the centre.

Ecological Autonomy

The third principle is ecological autonomy.

An ecosystem is not autonomous in the sense of being isolated from every external influence. All ecological life exists through relationship. Autonomy here means the ability of natural processes to continue without permanent human direction.

A restored wetland should regulate water, support species, and develop biological complexity without constant technological adjustment. A forest should regenerate through soil, seed, climate, and species interaction. A wildlife corridor should allow movement without requiring continuous human control.

Technology may help restore these conditions, but it should not become a permanent substitute for them.

Ecological autonomy provides a clear measure of success. If an ecosystem remains completely dependent on machinery, the project may have created a technological enclosure rather than genuine restoration.

The strongest outcome is not constant optimisation. It is the return of ecological capacity.

Biocentric Evaluation

The fourth principle is biocentric evaluation.

Many environmental projects are judged mainly through human benefit. Wetlands are protected because they reduce flooding. Forests are restored because they store carbon. Species are preserved because they support tourism or agriculture.

These benefits are real, but they are not sufficient.

A biocentric approach recognises that nonhuman life possesses value beyond its usefulness to people. Ecological restoration should therefore be assessed according to the flourishing of the wider community of life.

This does not require denying human needs. Human beings are part of creation and depend on healthy ecosystems. It means that human interest cannot remain the only measure.

An automated restoration project should ask whether species diversity is recovering, whether habitats are reconnecting, whether natural processes are returning, and whether the landscape can support life beyond immediate economic use.

The question is not simply, what does this ecosystem provide for us?

The deeper question is, can this ecosystem live?

Technological Withdrawal

The fifth principle is technological withdrawal.

This may be the most important part of the framework.

Modern technological systems often expand after they are introduced. They require updates, monitoring, energy, replacement, and further data. Ecological projects can become permanently dependent on technical infrastructure.

Cyber ecology should resist this pattern.

From the beginning, every system should include a plan for reduction, removal, or transfer to simpler forms of care. Technology should enter with an exit strategy.

A sensor network may remain useful for long term observation, but its presence should be reviewed. A robotic restoration system should stop when its work is complete. Artificial intelligence should not continue directing ecological processes once local and natural systems can function without it.

Withdrawal protects rewilding from becoming digital domination.

It also reflects a deeper theological principle. Human beings do not honour creation only by acting upon it. Sometimes they honour it by stepping back.

The Technocene covenant therefore values a form of power that can relinquish itself. It imagines technology not as a permanent ruler of the landscape, but as a temporary servant of recovery.

Automated Rewilding and the Ethics of Restraint

Automated rewilding brings technology into damaged environments without making technology the final centre of ecological recovery. Its purpose is not to construct an artificial wilderness. It is to assist the return of conditions in which ecosystems can develop with less human interference.

This requires a careful distinction between restoration and replacement.

Restoration supports living systems that have been weakened, fragmented, or displaced. Replacement attempts to reproduce ecological functions through machinery while leaving the deeper causes of damage unchanged. A robotic pollination system, for example, may temporarily support agriculture where pollinator populations have collapsed. Yet it cannot be treated as an adequate substitute for restoring habitats, reducing pesticide use, and protecting living pollinators.

The same principle applies across cyber ecology. Technology may support recovery, but it must not become an excuse for ecological loss.

Mapping Habitat Fragmentation

Habitat fragmentation is one of the most serious forms of ecological disruption. Roads, urban expansion, industrial development, fencing, agriculture, and resource extraction divide landscapes into smaller areas. Species may remain present within these areas, yet their ability to move, reproduce, feed, and respond to environmental change becomes limited.

Artificial intelligence can assist by analysing satellite images, topographical data, vegetation cover, migration routes, and human infrastructure. These systems can identify where ecological corridors have been broken and where reconnection may be most effective.

The value of this work lies in precision. Large restoration projects can fail when they are based on broad assumptions rather than careful attention to local conditions. Digital mapping may reveal that a relatively

small area of restored vegetation could reconnect two major habitats. It may identify a road crossing where animal deaths are frequent. It may show where fencing prevents seasonal movement.

The technology does not restore the corridor by itself. It makes the damage more visible and helps direct limited resources toward places where intervention may have the greatest effect.

The theological importance of this practice lies in its refusal to treat landscapes as empty space. Fragmentation is not only a technical problem. It is a disruption of relationships. Animals lose access to breeding areas. Plants lose pathways of distribution. Water systems are redirected. Ecological communities become isolated.

To repair fragmentation is therefore to restore relationship.

A creation theology shaped by relationship recognises that life is sustained through connection. No species exists entirely alone. Rewilding becomes an act of repair because it allows broken ecological bonds to form again.

Autonomous Seed Dispersal

Autonomous seed dispersal has become one of the most visible examples of technological restoration. Drones can carry and distribute seeds across large or difficult landscapes. They may reach steep slopes, post fire environments, former mining areas, or regions where ordinary planting would require heavy human presence.

The promise is significant, but the method requires caution.

Seed dispersal is not the same as forest restoration. A forest includes soil, fungi, insects, water, animals, decaying matter, and long periods of development. Planting large numbers of trees may create the appearance of recovery without restoring ecological complexity.[9]

Automated reforestation is therefore most responsible when it supports native diversity, local ecological knowledge, and long term recovery rather than rapid numerical targets. The goal should not be to maximise the number of seeds released. It should be to restore a living community.

Artificial intelligence may assist by identifying suitable planting areas, matching species to local conditions, monitoring germination, and detecting where further intervention is unnecessary. Yet the system must remain accountable to ecological realities that cannot be reduced to speed or scale.

A machine can distribute seeds quickly. It cannot command a forest into existence.

This limitation should be welcomed rather than treated as failure. It reminds human beings that creation develops through processes that cannot be fully controlled. Soil must receive the seed. Water must be available. Species must interact. Time must pass.

Automated seed dispersal becomes theologically meaningful when it serves these processes rather than pretending to replace them.

Robotic Removal of Invasive Species

Invasive species can cause severe harm within ecosystems where they have no natural controls. They may displace native plants, alter soil, consume vulnerable animals, or change fire patterns. Removal is often labour intensive and may disturb the environment further.

Robotic systems may offer more targeted methods. Machines equipped with visual recognition can identify particular plants. Autonomous devices may remove invasive growth in areas where chemical treatment would damage surrounding species. Underwater systems may detect and remove harmful organisms from rivers, lakes, or coastal environments.

The ethical value of this approach depends on accuracy, restraint, and local knowledge.

9Erica Olson-Bang, "Edward Schillebeeckx's Creation Theology as a Resource for Ecological Ethics," Horizons 38, no. 2 (2011): 253–73.

Not every introduced species should be treated through a simple category of purity and contamination. Ecosystems change. Some species become integrated over time. Others create serious imbalance. Decisions must therefore be based on ecological evidence rather than on a romantic desire to recreate an imagined untouched past.

The aim is not to purify nature. It is to protect the conditions in which ecological communities can continue.

Automation may reduce repeated human disturbance, but it can also cause harm if its recognition systems fail. A machine may remove the wrong species. It may damage habitats while operating. It may encourage excessive intervention because removal becomes easier.

For this reason, robotic restoration must remain subject to review. Human oversight is still necessary, especially in complex environments where ecological relationships are not fully understood.

Technology may improve precision, but humility remains essential.

Monitoring Water, Soil, and Animal Movement

Environmental sensors are central to cyber ecology. They can record water quality, soil moisture, air temperature, sound, movement, and chemical change. When placed carefully, they allow long term observation with less human intrusion.

This can be especially valuable in sensitive habitats. Repeated field visits may disturb breeding sites, damage vegetation, or alter animal behaviour. Remote systems may gather information while allowing the landscape to remain relatively undisturbed.

Animal movement data can reveal whether restored corridors are functioning. Acoustic monitoring can detect the return of species that are difficult to observe directly. Soil sensors can show whether vegetation is recovering. Water monitoring can identify pollution before visible damage spreads.

These systems create new possibilities for ecological attentiveness, but they also raise concerns.

Data ownership matters. Information about endangered species could be misused by hunters, collectors, or commercial developers. Local communities may lose authority over ecological knowledge gathered from their lands. Private companies may control the systems through which environmental decisions are made.

Cyber ecology must therefore include clear limits on access, storage, and use. Data should serve restoration rather than extraction.

The system should also avoid treating measurement as the whole of reality. What can be measured is important, but what cannot be easily measured may be equally significant. A landscape is more than a set of indicators. Ecological meaning includes history, memory, movement, adaptation, and forms of relationship that resist numerical reduction.[10]

Monitoring should deepen attention, not narrow it.

Automated Wildlife Corridors

Wildlife corridors are designed to reconnect divided habitats. They may include bridges over roads, tunnels beneath transport routes, restored vegetation between forest areas, or protected pathways through agricultural land.

Automation can improve their effectiveness. Sensors may identify when and where animals cross. Artificial intelligence can detect patterns of movement and reveal whether structures are being used. Warning systems may reduce vehicle speed when animals are nearby. Gates or barriers may respond to seasonal migration.

These systems can reduce death and restore movement, but their design must remain centred on animal behaviour rather than human convenience.

10James R. Miller and Richard J. Hobbs, “Rewilding and Restoration,” in Rewilding, ed. Nathalie Pettorelli, Sarah M. Durant, and Johan T. du Toit (Cambridge: Cambridge University Press, 2019), 123–41.

A corridor should not be judged successful because it looks impressive or satisfies regulatory requirements. It should be judged by whether animals use it safely and whether ecological connection improves.

This requires patience. Different species respond differently. Some require cover. Others avoid noise or light. Some move seasonally. Others depend on water access. A single structure cannot serve every form of life.

Cyber ecology may help interpret these patterns, but it must remain flexible. The technology should adapt to the ecosystem, not demand that the ecosystem adapt to the technology.

The deeper theological significance of wildlife corridors lies in the restoration of movement. Human development often assumes that land exists for fixed ownership and permanent boundaries. Wildlife movement challenges this assumption. Animals do not recognise property lines, political borders, or transport plans.

Rewilding therefore asks human societies to make room.

Technology can support this act of making room by identifying where movement has been blocked and helping reduce conflict. Yet the moral action remains one of restraint. Humanity allows other creatures to pass.

Early Warning Systems

Artificial intelligence and automated sensors can also provide early warning of fire, pollution, illegal clearing, poaching, disease, and sudden ecological stress.

These systems may detect smoke before a fire spreads. They may identify unusual changes in water chemistry. Satellite data may reveal unauthorised land clearing. Acoustic systems may recognise gunshots or machinery in protected areas. Wildlife data may indicate disease within a population before large scale loss occurs.

Early warning can reduce harm, but it must not be mistaken for prevention.

A system that detects illegal clearing is valuable only if institutions are willing to act. A sensor that identifies pollution cannot repair the political and economic structures that allowed the pollution. Technology may reveal damage, but it cannot replace justice.

This is one of the limits of cyber ecology. Ecological collapse is not only a technical problem. It is shaped by power, profit, inequality, and political choice. Automated monitoring may improve response, but it cannot resolve these deeper causes on its own.

The Technocene covenant therefore requires social accountability as well as technical capacity. It asks who receives the warning, who has the authority to act, whose interests are protected, and who bears the cost.

Without these questions, technology may create the appearance of responsibility while leaving destructive systems untouched.

The Ethics of Stepping Back

The common feature across these examples is not automation itself. It is the possibility of reducing human pressure.

This is why restraint must remain central.

A successful restoration project does not merely add new tools to a damaged landscape. It changes the human relationship with that landscape. Extraction is limited. Movement is restored. Ecological processes regain space. Human presence becomes less dominant.

Stepping back does not mean abandoning responsibility. It means refusing to confuse responsibility with permanent control.

This distinction is important within Christian theology. Human beings may be called to care, repair, and protect. Yet care does not require ownership of every outcome. Repair does not require continuous management. Protection does not require constant presence.

There is a form of faithfulness that acts, and there is a form of faithfulness that releases.

Automated rewilding can serve both. It may assist where damage requires action. It may also indicate when action should end.

The ethical maturity of the Technocene covenant appears in this second moment. Humanity does not prove its wisdom only by knowing how to intervene. It proves wisdom by recognising when intervention has become unnecessary.

Eschatological Participation

Christian eschatology gives ecological restoration a future direction, but it must be handled with care. The language of renewal can easily be misused. It may encourage exaggerated claims that human action can build the kingdom of God through environmental projects or technological progress.

Such claims would place too much confidence in human capacity.

The final renewal of creation is not a project that humanity can complete. Christian hope remains grounded in divine action. The eschaton cannot be engineered, programmed, or achieved through restoration policy.

Yet this does not make present ecological action meaningless.

The future promised by Christian faith shapes the way believers live now. Hope produces conduct. If creation is destined for renewal rather than abandonment, then the treatment of creation in the present carries theological weight.

Ecological repair may therefore become a form of participation without becoming a form of completion.

Creation as Part of Christian Hope

Christian eschatology has often been presented in ways that focus almost entirely on human destiny. Heaven becomes the central expectation, while the material world appears temporary or disposable.

This narrow view weakens ecological responsibility.

The biblical vision of renewal is broader. It concerns creation as a whole. The language of resurrection, new creation, liberation, restoration, and reconciliation points toward a future in which material existence is not rejected but transformed.

This matters because the future of creation influences the ethics of the present.

A world understood only as temporary may be treated carelessly. A world understood as belonging within divine renewal must be approached differently.

The ecological crisis therefore raises an eschatological question. Do human beings live as though creation has no future, or as though its future matters before God?

The Technocene covenant answers by treating ecological recovery as an act of alignment with the promised renewal of all things.

Proleptic Signs

The term proleptic describes an action in the present that anticipates a future reality.

Ecological restoration may be understood in this way.

A recovered river does not establish the final renewal of creation. A restored forest does not end suffering. A returning species does not remove death from the world. Yet each may become a limited sign that destruction is not accepted as final.

These signs remain incomplete. They can be damaged again. They exist within conditions of climate instability, political conflict, and continuing ecological loss.

Their value does not depend on perfection.

A proleptic act does not claim that the future has fully arrived. It allows the character of the future to shape present action.

This is why ecological restoration can be meaningful within Christian eschatology. It expresses allegiance to renewal rather than ruin.

The hope of a restored creation becomes visible through practices that protect, reconnect, and heal.

Participation Without Control

The concept of participation must remain separate from control.

Human beings participate in ecological renewal by acting faithfully within their limits. They do not direct the final outcome. They do not possess complete knowledge. They do not create redemption.

This distinction protects the argument from technological triumphalism.

Artificial intelligence may help restore a habitat. It cannot redeem creation.

Robotics may reduce pollution. They cannot overcome death.

Data may improve ecological decision making. It cannot reveal the whole purpose of the created order.

Technology therefore remains a servant within eschatological participation. It does not become the agent of salvation.

This humility is essential because the Technocene often encourages the opposite belief. Technological culture can present humanity as capable of solving every crisis through greater control. Christian eschatology challenges this confidence.

The future belongs to God, not to the machine.

Yet human action still matters. Participation means that present responsibility is real even when final completion is beyond human power.

Hope as Ecological Practice

Hope is sometimes treated as an inner attitude. Within ecological theology, it must also become practice.

Hope plants, protects, restores, limits, and repairs.

It does not wait passively for divine intervention while continuing destructive behaviour. Nor does it assume that every problem can be solved through human effort.

Christian hope lives between despair and control.

Despair says that ecological collapse is unavoidable and action is pointless.

Control says that technology will master the crisis and remove every limit.

Eschatological participation rejects both.

It acts because creation matters. It remains humble because human power is limited. It continues because the promised future gives meaning to present faithfulness.

Automated rewilding can become one expression of this hope when it supports ecological freedom rather than technological dominance.

Rewilding as a Sign of Renewal

Rewilding carries a distinctive eschatological meaning because it does not seek to force creation into a human plan. It seeks to restore the capacity of living systems to continue.

This makes rewilding more than conservation in the narrow sense. Conservation may preserve selected objects. Rewilding restores movement, relation, and process.

A reconnected habitat allows migration.

A restored river allows flow.

A recovered forest allows succession.

A returning predator reshapes ecological balance.

These processes express life beyond human control.

Within an eschatological framework, such recovery may be seen as a sign of liberation. Creation is given room to breathe, move, reproduce, and adapt.

The sign remains partial, but it is not insignificant.

Every act that reduces domination and restores life points toward a different relation between humanity and the world.

The Eschaton Cannot Be Rewilded by Technology

The language of rewilding the eschaton must remain metaphorical and carefully limited.

The eschaton itself cannot be designed through cyber ecology. It cannot be produced by automation. The title of this study does not suggest that technology can repair the final destiny of creation.

Rather, the phrase identifies a theological imagination in which present ecological action is guided by the hope of cosmic renewal.

Technology may help rewild damaged land. It may also help Christian thought recover a less human centred vision of the future.

The final renewal is not only about humanity. It concerns the whole created order.

In this sense, rewilding becomes both ecological and theological. It restores landscapes, and it also restores the place of nonhuman creation within Christian hope.

The Technocene covenant therefore asks believers to imagine the future of creation with greater breadth. The eschaton is not an escape from the earth. It is the fulfilment of creation beyond corruption.

Present restoration cannot complete that future, but it can witness to it.

The Limits of the Technocene Covenant

The Technocene covenant offers a way to connect ecological restoration, technological creativity, and Christian hope. Yet the proposal remains vulnerable to serious misuse. Any theology that treats technology as a possible instrument of healing must also examine the systems of power within which technology is created and controlled.

Artificial intelligence, robotics, and digital monitoring do not exist outside economics or politics. They are designed, funded, owned, and managed by institutions. These institutions may include governments, corporations, universities, military organisations, conservation groups, and private foundations. Their goals are not always aligned with ecological flourishing.

For this reason, technological capacity cannot be separated from questions of authority.

Who designs the system?

Who owns the data?

Who decides what ecological recovery should look like?

Who benefits from the project?

Who carries the risk when the technology fails?

Who has the power to stop the system?

These questions are not secondary. They determine whether cyber ecology becomes a form of care or another form of control.

The Risk of Technological Optimism

One of the clearest dangers is technological optimism.

Technological optimism assumes that environmental collapse can be solved through innovation without major changes to consumption, extraction, land use, or economic priorities. It allows societies to continue destructive practices while trusting that future tools will repair the consequences.

This attitude is especially attractive because it avoids sacrifice. It promises restoration without restraint.

A corporation may continue clearing land while funding automated tree planting elsewhere. A government may permit ecological damage while investing in monitoring systems. An industry may present artificial intelligence as evidence of environmental responsibility without changing the activity that created the crisis.

In such cases, technology does not restore creation. It protects the legitimacy of destruction.

The Technocene covenant must reject this logic. Restoration cannot be used to excuse continued harm. Ecological repair becomes credible only when it is joined to prevention.

A machine that plants trees does not justify the destruction of an ancient forest. A robotic system that removes pollution does not justify continued pollution. An algorithm that measures biodiversity loss does not answer the moral failure that caused the loss.

Technology may help address damage, but it must not become a substitute for repentance.

Within Christian theology, repentance involves more than regret. It requires a change of direction. Ecological repentance therefore includes the refusal of practices that continue to wound creation.

The Technocene covenant remains empty if it celebrates restoration while allowing the structures of destruction to remain untouched.

The Centralisation of Power

Advanced technologies often require specialised knowledge, financial investment, and large infrastructures. This can centralise ecological authority within powerful institutions.

A local community may depend on an external company to interpret environmental data. A conservation project may rely on software that local people cannot access or challenge. Governments may use ecological monitoring to expand surveillance rather than protect ecosystems.

The result may be a new form of dependence.

Communities that have cared for land across generations may be treated as passive recipients of technological expertise. Their knowledge may be ignored because it is not recorded in digital form. Decisions may be made far from the landscapes they affect.

Cyber ecology must therefore remain accountable to local participation.

This does not mean that every community will possess the same technical resources. It means that ecological technology should not remove decision making from those who live within and depend upon the environment.

Local knowledge can reveal seasonal change, animal behaviour, water patterns, plant relationships, and historical damage that digital systems may not recognise. Indigenous knowledge is especially important because it often reflects long relationships with land that predate modern ecological science.

The Technocene covenant should therefore bring forms of knowledge into conversation rather than placing one above all others.

Artificial intelligence may process information quickly. It does not possess the moral authority to erase human experience.

Data and the Reduction of Life

Cyber ecology depends heavily on data. Environmental sensors, satellite images, acoustic recordings, genetic information, and movement tracking can reveal patterns that would otherwise remain hidden.

Yet data can also reduce life to what can be counted.

An ecosystem may become a collection of variables. A species may become a population figure. A forest may become a carbon estimate. A river may become a flow measurement.

These measurements are useful, but they are never complete.

Living systems contain histories, relationships, vulnerabilities, and forms of value that cannot be fully represented in numbers. The danger appears when data is treated not as one form of knowledge, but as reality itself.

A forest with acceptable carbon storage may still be ecologically poor. A river with improved chemical readings may still be cut off from its floodplain. A rising population of one species may hide the decline of another.

Theological reflection resists reduction because creation is not merely functional. It has value before God beyond human measurement.

Cyber ecology must therefore use data with humility. Information should guide attention, but it should not define the whole meaning of an ecosystem.

The machine may reveal change. It cannot exhaust the significance of life.

The Energy Cost of Digital Restoration

Technological systems also consume resources.

Artificial intelligence requires energy. Sensors require materials. Robots require manufacturing, transport, maintenance, and replacement. Data centres depend on electricity, water, and mineral extraction. Satellites require launch systems and complex industrial support.

An ecological project may therefore create new environmental burdens while attempting to repair old ones.

This does not make digital restoration impossible, but it requires honest accounting.

The environmental cost of a system must be compared with the harm it prevents or repairs. A highly complex technological response may not be justified if a simpler method could achieve the same result.

The principle of minimal intervention applies here as well.

Technology should not be used merely because it is available. Its material cost must remain visible.

A project that restores one ecosystem while contributing to destruction elsewhere cannot easily be called responsible. The Technocene covenant therefore requires a wider view of consequence.

The minerals used in a device come from somewhere.

The energy that powers an algorithm is produced somewhere.

The waste created by outdated equipment remains somewhere.

Ecological care cannot be limited to the place where the technology is deployed.

The Danger of Permanent Dependence

Automated restoration may also create permanent dependence.

A landscape may begin to rely on continuous monitoring, mechanical intervention, and digital adjustment. Ecological recovery then becomes inseparable from technical maintenance.

This may be unavoidable in some highly damaged environments, especially where climate change has altered basic conditions. Yet permanent technological dependence should not be accepted without question.

The aim of rewilding is the recovery of ecological capacity.

If an ecosystem cannot function without constant machine direction, then the project may have created a managed technical environment rather than a restored living system.

This does not mean the project has no value. It means its limits must be named honestly.

Some landscapes may no longer return to earlier conditions. Some species may require long term support. Some ecosystems may develop into new forms under changing climate conditions.

The Technocene covenant should not promise complete recovery where such recovery is impossible.

It should remain committed to life even within partial, uncertain, and altered conditions.

Justice and Unequal Vulnerability

Ecological collapse does not affect every community equally. Poor communities, Indigenous peoples, displaced populations, and regions with limited political power often carry the greatest burden.

The same inequality may shape technological restoration.

Wealthy regions may gain advanced monitoring systems while vulnerable communities continue to face pollution, land loss, and unsafe water. Ecological technology may protect valuable landscapes while ignoring places considered economically unimportant.

Justice must therefore remain central.

A Christian approach to cyber ecology cannot speak of creation in general while neglecting people whose lives are already shaped by environmental harm.

Biocentric care and human justice are not enemies. The wellbeing of human communities and the flourishing of ecosystems are deeply connected.

The Technocene covenant should resist projects that protect nature by removing local people without consent. It should also resist projects that sacrifice ecosystems for short term economic benefit.

The challenge is to seek forms of restoration that honour both human dignity and nonhuman life.

Accountability and Transparency

Cyber ecological systems should be open to review.

Their goals, methods, data practices, risks, and environmental costs should be explained clearly. Communities should know how decisions are made and how errors can be challenged.

Artificial intelligence should not become a hidden authority.

If an algorithm recommends the removal of a species, the closure of land, or the relocation of a community, the reasoning must be open to examination. Technical complexity cannot be used to avoid moral accountability.

Transparency also includes acknowledging uncertainty.

Ecological systems are complex. Models may be wrong. Predictions may fail. Restoration may produce unexpected results.

The Technocene covenant should therefore support forms of governance that can revise decisions, respond to failure, and stop harmful intervention.

Humility must become institutional, not merely personal.

The Technocene Covenant as a Moral Practice

The word covenant describes a relationship shaped by commitment, responsibility, and limit. In this context, it names a moral practice rather than a new doctrine.

The Technocene covenant asks humanity to accept that technological power creates obligations.

The greater the capacity to alter creation, the greater the responsibility to exercise restraint.

This covenant includes several commitments.

It commits technological creativity to the service of life.

It refuses to treat ecological systems as objects of unlimited management.

It recognises that nonhuman creation possesses value beyond human use.

It requires accountability to local communities and future generations.

It accepts that restoration must be joined to prevention.

It values technology that can withdraw when its work is complete.

It understands ecological healing as a sign of hope rather than a claim to salvation.

These commitments form a practical theology of the Technocene.

The covenant does not ask whether humanity should return to a world without technology. Such a return is neither possible nor necessarily desirable. It asks what kind of technological civilisation humanity should become.

Will the technosphere continue to grow through extraction, control, and dependence?

Or can technological capacity be redirected toward repair, restraint, and ecological freedom?

The answer will not be found in machinery alone.

It will depend on moral imagination.

Conclusion

The ecological crisis and the technological age are not separate realities. They have developed together and must now be considered together. Technology has contributed to environmental destruction, but it also possesses capacities that may assist ecological repair.

The central question is not whether technology is natural or artificial. It is whether technological power serves domination or restoration.

The Technocene covenant offers a framework for this distinction. It understands artificial intelligence, automation, robotics, and digital monitoring as morally ambiguous tools. Their value depends on the relationships they create and the ends they serve.

When technology increases extraction, centralises control, replaces living systems, or excuses continued destruction, it deepens the crisis.

When it identifies harm, supports careful repair, reduces human intrusion, and restores ecological autonomy, it may become an instrument of healing.

Rewilding provides the clearest ecological form of this vision. Its purpose is not to manage nature more efficiently. It is to restore the conditions in which ecological life can continue with less human direction.

Cyber ecology can serve this purpose when it remains limited, accountable, and willing to withdraw.

The theological meaning of this work appears within creation and eschatology.

Creation theology affirms that the world possesses value beyond human use. It also places human creativity within creation rather than outside it. Technology is therefore not condemned simply because it is made. It must be judged according to whether it honours or violates the life from which it emerges.

Eschatology gives ecological restoration a future horizon.

Human beings cannot produce the renewal of all things. No technological system can create the eschaton. Yet present acts of repair may witness to the future promised by Christian hope.

They are proleptic signs.

A restored habitat, a returning species, a river allowed to flow, or a forest recovering beyond constant management does not complete redemption. Each act may still reveal a refusal to accept destruction as final.

This is the deepest meaning of eschatological participation.

It is not control over the future.

It is faithfulness in the present.

The Technocene covenant therefore calls for a disciplined use of technological power. It asks humanity to build tools capable not only of acting, but also of stopping. It values systems that reduce their own necessity. It recognises that wisdom may appear not in permanent mastery, but in the recovery of conditions where creation can flourish without us at the centre.

The future of ecological theology will not be shaped by a simple choice between machine and nature.

The more important choice is between domination and restraint.

Technology may continue to extend the human grip upon the earth, or it may help humanity loosen that grip.

When technological creativity becomes accountable to life, when rewilding restores ecological freedom, and when present healing reflects hope in the renewal of creation, the Technocene need not remain only an age of crisis.

It may also become an age in which humanity learns that true participation in creation begins with the courage to repair what has been harmed and the humility to step back when life begins to return.

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